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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, ABHINAV	COURSE CODE	JA, EA
PHASE CODE(S)	JA, EA	TOTAL PAGES	16	BATCH CODE(S)	JA, EA

Target Examination & Year:

JEE (MAIN+ADVANCED) 2024

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

DATE & DAY:

29st October 2023 | Sunday

Duration & Time:

3 Hrs | 09:30 AM to 12:30 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)

Scan QR Code for Video Solutions → Coming Soon

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Academic Session: 2023-24

PAT : TOPIC-WISE WEIGHTAGE SHEET (WS)

	P-1	Total		P-1	Total
Total Qs	90	90	Subject wise Qs.	30	30
Max. Marks	300	300	Subject wise Marks	100	100

PHYSICS

S.No.	Topic Name	Question Type & Sequencing				Total Qs. (Topic-wise)	Total Marks (Topic-wise)	% Weightage (Topic-wise)
		MCQ		NVQ				
		No. of Qs.	Qs. Sequencing	No. of Qs.	Qs. Sequencing			
	Class-11	**20**		**10**		**30**	**120**	**100.00%**
1	Mathematical Tools	1	1	_	_	1	4	3.33%
2	System of Particles, Centre of Mass, Momentum and Collision	5	2,3,7,12,18	5	25,26,27,29,30	10	40	33.33%
3	Rectilinear Motion	2	4,5	1	23	3	12	10.00%
4	Relative Motion	2	6,8	_	_	2	8	6.67%
5	Newton's laws of Motion	2	9,10	_	_	2	8	6.67%
6	Friction	1	11	1	22	2	8	6.67%
7	Circular Motion	5	13,14,16,19,20	2	21,28	7	28	23.33%
8	Work, Power & Energy	2	15,17	_	_	2	8	6.67%
9	Projectile Motion	_	_	1	24	1	4	3.33%
	Total	**20**		**10**		**30**	**120**	**100%**

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Academic Session: 2023-24

PAT : TOPIC-WISE WEIGHTAGE SHEET (WS)

CHEMISTRY

S.No.	Topic Name	Question Type & Sequencing				Total Qs. (Topic-wise)	Total Marks (Topic-wise)	% Weightage (Topic-wise)
		MCQ		NVQ				
		No. of Qs.	Qs. Sequencing	No. of Qs.	Qs. Sequencing			
Physical Chemistry								
	Class-11	**10**		**5**		**15**	**60**	**50.00%**
1	Atomic Structure	4	31,32,33,40	_	_	4	16	13.33%
2	Mole concept	2	34,35	1	51	3	12	10.00%
3	Gaseous State	2	36,37	3	52,53,55	5	20	16.67%
4	Chemical Equilibrium	1	38	_	_	1	4	3.33%
5	Introduction to chemistry	1	39	1	54	2	8	6.67%
Inorganic Chemistry								
	Class-11	**5**		**1**		**6**	**24**	**20.00%**
6	Chemical Bonding	2	41,42	1	59	3	12	10.00%
7	Periodic Table Periodicity	3	43,48,50	_	_	3	12	10.00%
Organic Chemistry								
	Class-11	**5**		**4**		**9**	**36**	**30.00%**
8	Structural Identification	3	44,45,47	4	56,57,58,60	7	28	23.33%
9	IUPAC & Structural Isomerism	2	46,49	_	_	2	8	6.67%
	Total	**20**		**10**		**30**	**120**	**100%**

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PAT : TOPIC-WISE WEIGHTAGE SHEET (WS)

MATHEMATICS

S.No.	Topic Name	Question Type & Sequencing				Total Qs. (Topic-wise)	Total Marks (Topic-wise)	% Weightage (Topic-wise)
		MCQ		NVQ				
		No. of Qs.	Qs. Sequencing	No. of Qs.	Qs. Sequencing			
	Class-11	**20**		**10**		**30**	**120**	**100.00%**
1	Mathematical Reasoning	2	61,66	1	85	3	12	10.00%
2	Permutation and Combination	3	62,70,74	1	86	4	16	13.33%
3	Basics	1	63	2	81,87	3	12	10.00%
4	Sequence and Series	3	64,76,80	2	84,88	5	20	16.67%
5	Quadratic Equation	4	65,69,71,77	1	90	5	20	16.67%
6	Trigonometry	3	67,72,78	1	82	4	16	13.33%
7	Binomial Theorem	3	68,73,79	2	83,89	5	20	16.67%
8	Sets	1	75	_	_	1	4	3.33%
	Total	**20**		**10**		**30**	**120**	**100%**

ANSWER KEY (AK)

PAPER											
PART-A: PHYSICS	Q.No.	1	2	3	4	5	6	7	8	9	10
	Ans.	3	3	1	4	4	1	2	3	1	1
	Q.No.	11	12	13	14	15	16	17	18	19	20
	Ans.	4	2	4	2	4	2	2	3	3	2
	Q.No.	21	22	23	24	25	26	27	28	29	30
	Ans.	0003	0002	0002	0008	0002	0002	0016	0001	0001	0005
PART-B: CHEMISTRY	Q.No.	31	32	33	34	35	36	37	38	39	40
	Ans.	1	4	3	1	4	4	4	3	2	2
	Q.No.	41	42	43	44	45	46	47	48	49	50
	Ans.	2	4	4	3	4	1	4	4	2	2
	Q.No.	51	52	53	54	55	56	57	58	59	60
	Ans.	0091	0003	0329	0058	0024	0004	0004	0004	0011	0042
PART-C: MATHS	Q.No.	61	62	63	64	65	66	67	68	69	70
	Ans.	4	3	2	1	2	1	1	2	3	4
	Q.No.	71	72	73	74	75	76	77	78	79	80
	Ans.	2	1	1	4	4	3	4	2	4	3
	Q.No.	81	82	83	84	85	86	87	88	89	90
	Ans.	0064	0000	0003	0006	0002	0120	0100	0006	0004	0009

STUDENT'S SPACE

TEXT SOLUTIONS (TS)

PAPER

PART-A: PHYSICS

1. $(\vec{a}+\vec{b}) = k(\vec{a}-\vec{b})$ (k > 1)

$\Rightarrow \quad \vec{a} = \left(\frac{K+1}{K-1}\right)\vec{b}$

$\Rightarrow$ $\vec{a}$ is in same direction of $\vec{b}$

$\vec{a}$ की दिशा $\vec{b}$ के समान है।

$\vec{a}\times\vec{b} = 0$ & तथा $|\vec{a}| > |\vec{b}|$.

$= \frac{7}{\sqrt{2}}$

2. Mg is balanced by upward impulsive force.

ऊपर की ओर कार्यरत आवेगी बल Mg को संतुलित करता है।

Fdt = dp

Fdt = mu (1+e)

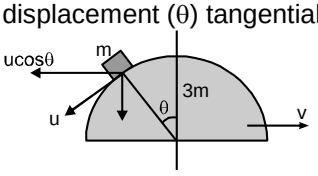
Mg = mu (1+e)n

n = no. of bullets per second

n = प्रति सैकण्ड गोलीयों की संख्या

$n = \frac{Mg}{mu(1+e)}$

3. Let u be velocity of the particle relative to centre of the hemisphere at an angular displacement (θ) tangentially.



As the external force on the system is zero. From conservation of linear momentum,

$P_f = P_i$

$\Rightarrow \quad 3mv + m(v - u\cos\theta) = 0$

$\Rightarrow \quad u = \frac{4v}{\cos\theta}$.

Hence, angular velocity of the particle relative to the centre of hemisphere

$\omega = \frac{u}{R} = \frac{4v}{R\cos\theta}$.

4. $m\frac{dV}{dt} = \frac{R}{t^2}V$

$\Rightarrow \quad m\frac{dv}{v} = R\frac{dt}{t^2}$

$\Rightarrow \quad m\int_{V_1}^{V_2}\frac{dV}{V} = R\int_{t_1}^{t_2}\frac{dt}{t^2}$

$\Rightarrow \quad m\ell n\left(\frac{V_2}{V_1}\right) = \frac{-R}{t}\Big|_{t_1}^{t_2}$

$\Rightarrow \quad \ell n\left(\frac{V_2}{V_1}\right) = \frac{-R}{m}\left(\frac{1}{t_2}-\frac{1}{t_1}\right)$

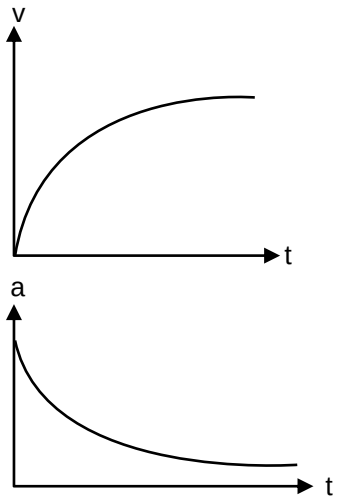
log V vs 1/t will be a st. line curve

5. $a = g - \alpha v$

$\frac{dv}{dt} = g - \alpha v$

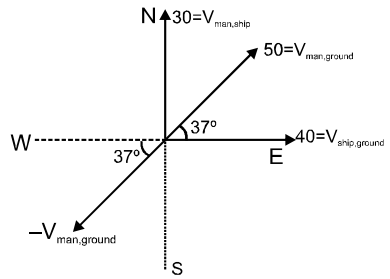
$\int_0^v \frac{dv}{g-\alpha v} = \int_0^t dt \Rightarrow \ln\left(\frac{g-\alpha v}{v}\right) = -\alpha t$

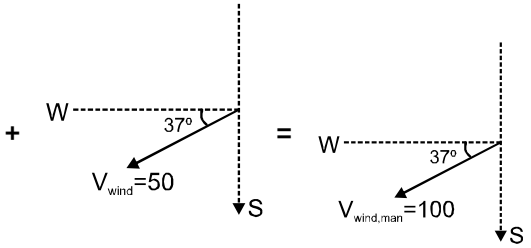
$V = v_0(1 - e^{-\alpha t})$, $a = \frac{dv}{dt} = v_0\alpha e^{-\alpha t} = a_0 e^{-\alpha t}$



6. Flag will flutter in the direction of wind and opposite to the direction of velocity of man i.e. in the direction of V_{wm}

झण्डा हवा की दिशा में तथा व्यक्ति के वेग की दिशा के विपरीत में लहरायेगा अर्थात V_{wm} की दिशा में





7. Velocity of bucket at lower most point = $\sqrt{2g\ell}$

when bucket will be filled with water, its velocity will be $V = \frac{M}{m+M}\sqrt{2g\ell}$

From energy conservation

$\frac{1}{2}(M + m).V^2 = (M + m)\,gh$

$\Rightarrow \quad h = \left(\frac{M}{M+m}\right)^2 \ell$

8. velocity of particle wrt ground is vertically up so path will be straight line

धरातल के सापेक्ष कण का वेग ऊर्ध्वाधर ऊपर की ओर है अतः पथ एक सरल रेखीय होगा।

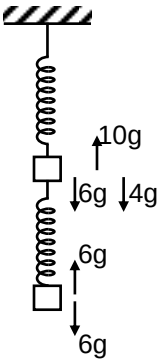
9. In the frame of wedge acceleration = (g + a) $\sin\theta = 7\ m/s^2$

Normal reaction $m(g + a)\cos\theta = 7\sqrt{3}$ N

वेज के तन्त्र में त्वरण = $(g + a)\sin\theta = 7\ m/s^2$

अभिलम्ब प्रतिक्रिया $m(g + a)\cos\theta = 7\sqrt{3}$ N

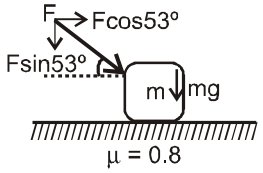
10.



6g $a = 6g/4 = 15\ m/s^2$

11. To Slide फिसलने के लिए

$F\cos 53^\circ > \mu_s (mg + F\sin 53^\circ)$

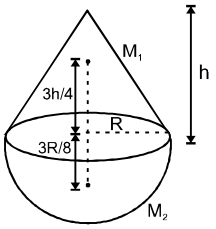


$\frac{3F}{5} > 0.8\ mg + \frac{3.2}{5}F$

Which is impossible, so block cannot slide. This situation is called self-locking.

यह सम्भव नहीं है अतः ब्लॉक नहीं फिसलेगा। यह स्थिति स्वःतालाबन्दी कहलाती है।

12.



$y_{cm} = 0$

$$\frac{M_1\frac{h}{4} - M_2\frac{3R}{8}}{M_1 + M_2} = 0$$

$M_1\ \frac{h}{4} = M_2\frac{3R}{8}$

$\rho \times \frac{1}{3}\ \pi R^2 h\ \frac{h}{4} = \rho \times \frac{2}{3}\ \pi R^3 .\ \frac{3R}{8}$

$h = \sqrt{3}\ R.$

13. **(Easy)** In nonuniform circular motion, particle's kinetic energy changes with time. By work energy theorem, net work done on the particle is non zero. In uniform circular motion, total force on the particle is centripetal in nature.

असमान वृत्तीय गति में कण की गतिज ऊर्जा समय के साथ परिवर्तित होती है कार्य ऊर्जा प्रमेय से कण पर किया गया कुल कार्य शून्य नही है समान वृत्तीय गति में कुल बल अभिकेन्द्रीय बल होता है।

14. $v^2 = 4/r$

$m^2 v^2 = \frac{4m^2}{r} \quad \therefore \quad p = \frac{2m}{\sqrt{r}}$

15. $v = a\sqrt{s} = \frac{ds}{dt}$

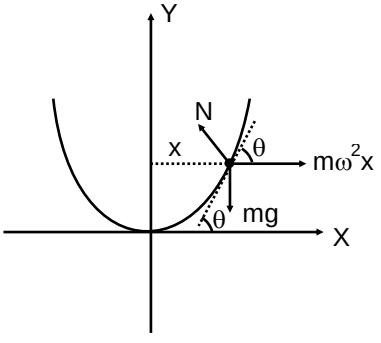
$2\sqrt{s} = at$

$S = \frac{a^2t^2}{4}$

$F = m \times \frac{a^2}{2}$

$\text{Work} = \frac{ma^2}{2} \times \frac{a^2t^2}{4} = \frac{1}{8}ma^4t^2$

16.



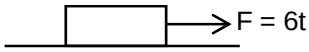
(1) $m\omega^2 x \cos\theta = mg \sin\theta \Rightarrow \tan\theta = \frac{\omega^2 x}{g}$;

$\tan\theta = \frac{dy}{dx} = 10x$

(2) $N = m\omega^2 x \sin\theta + mg\cos\theta$

$\Rightarrow$ $\boxed{\omega = 10 \text{ rad/sec}}$

17.



$a = \frac{F}{m} = \frac{6t}{1} = 6t$

$\frac{dv}{dt} = 6t$

$dv = 6tdt$

$\int_0^v dv = 6\int_0^v tdt$

$v = 6\left[\frac{t^2}{2}\right]_0^1 = 3$

$W = \Delta KE = K_F - K_i$

$= \frac{1}{2}(1)(3)^2 = 4.5$ J

18. Statement-2 contradicts Newton's third law and hence is false.
वक्तव्य-2 न्यूटन के तीसरे नियम का विरोध करता है तथा इसलिये असत्य है।

19. (3) Ball falls outside the circular track
(3) गेंद वृत्ताकार पथ के बाहर गिरेगी।

20. $T_{max} = 4T_{min}$

$mg + 2mg(1-\cos\theta_0) = 4mg\cos\theta_0$

$\cos\theta_0 = \frac{1}{2}$

$\theta_0 = 60°$

21. $T_2 = m_2\omega^2(2l)$

$T_1 - T_2 = m_1\omega^2\ell$

$T_1 = m_1\omega^2\ell + 2m_2\omega^2\ell$

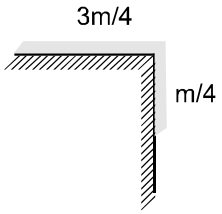
given (दिया है)

$\frac{T_1}{T_2} = \frac{5}{2}.$

$\Rightarrow \quad \frac{m_1 + 2m_2}{2m_2} = \frac{5}{2}$

$\Rightarrow \quad \frac{m_1}{m_2} = 3.$

22. Apply system equation निकाय की समीकरण लगाने पर



$\frac{m}{4}g = \frac{3m}{4}g \times \mu$

$\Rightarrow \quad \mu = 1/3 = 0.33$

Ans. 2

23. $\int_{6.25}^{0} \frac{dv}{\sqrt{v}} = -2.5\int_0^t dt$

$\left|2\sqrt{\upsilon}\right|_{6.25}^{0} = -2.5\ t$

$2.\sqrt{6.25} = 2.5\ t$

$\Rightarrow \quad t = 2$ sec. **Ans.**

24. $-200 = 25\sin 37^\circ t - 1/2\ (10)\ t^{2\backslash}$

$\Rightarrow \quad t = 8$ sec.

25. Velocity before collision टक्कर के पहले वेग $= \sqrt{2g16}$

velocity after collision टक्कर के पश्चात् वेग $= \sqrt{2g4}$

$e = \frac{\sqrt{2g4}}{\sqrt{2g16}} = \frac{1}{2}$

26. $r_1 = \frac{[-\sigma\times\pi R^2]\times R}{[-\sigma\times\pi R^2]+[\sigma\times\pi(2R)^2]}$ &

$r_2 = \frac{[2\sigma\times\pi R^2]\times R}{[2\sigma\times\pi R^2]+[\sigma\times\pi(2R)^2]} \Rightarrow \left|\frac{2r_2}{r_1}\right| = 2$

27. $m_1 \longrightarrow u_1 = \frac{3}{m_1}$

$m_2 \longrightarrow u_2 = 0$

$v_1 = \frac{1}{m_1}$ $\longleftarrow$ m_1 $\qquad$ $m_2 \longrightarrow$

$v_2 = \frac{4}{m_2}$

For elastic collision, velocity of separation = velocity of approach
प्रत्यास्थ टक्कर के लिए, पास आने का वेग = दूर जाने का वेग

$\therefore \quad \frac{4}{m_2} + \frac{1}{m_1} = \frac{3}{m_1}$

$4 + \frac{m_2}{m_1} = \frac{3m_2}{m_1} \Rightarrow \frac{m_2}{m_1} = 2$

28. $\omega = \sqrt{\frac{\mu g}{R}} = 1 \text{rad/sec}$

29. $J = mv - 0$

$\frac{t^3}{3} = mv$

$F = \frac{dp}{dt}$

$t^2 = ma = f$

$P = Fv = t^2 \times \frac{t^3}{3m}$

$81 = \frac{3^5}{3m}$

$m = 1$ kg.

30. $a = \mu g = (.2)(10) = 2 \text{ m/s}^2$.

$v^2 = 1^2 - 2(2)\left(\frac{16}{100}\right) = 1 - \frac{16}{25} = \frac{9}{25}$

$\therefore v = 3/5$ m/s

cons. of linear momentum

$\Rightarrow 2(3/5) = 2(v_1) + 4\, v_2$

$\therefore v_1 + 2v_2 = 3/5$ .... (1)

$e = 1 \Rightarrow 3/5 = v_2 - v_1$ .... (2)

(1) and (2) $\Rightarrow 3v_2 = 6/5 \Rightarrow v_2 = 2/5$ m/s.

and $v_1 = v_2 - 3/5 = \frac{2}{5} - \frac{3}{5} = -\frac{1}{5}$ m/s

x_2 = Distance covered by 4 kg block

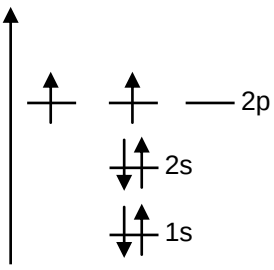
$= \frac{(2/5)^2}{2\ (2)} = \frac{4}{100}$ m = 4 cm

x_1 = Distance covered by 2 kg block in left direction = $\frac{1}{100}$ m = 1 cm.

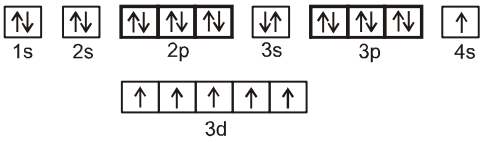
Hence ANS = $x_1 + x_2 = 5$ cm.

PART-B: CHEMISTRY

31. (1) Energy



32.



Out of 6 electrons in 2p and 3p must have on electron with m = +1 and $s = \frac{1}{2}$ but in 3d-subshell an orbital having m = +1 may have spin quantum no. $-\frac{1}{2}$ or $+\frac{1}{2}$.

Therefore, minimum and maximum possible values are 2 and 3 respectively.

2p तथा 3p मे 6 इलेक्ट्रॉन m = +1 तथा $s = \frac{1}{2}$ मान रखने चाहिए लेकिन 3d-उपकोश मे m = +1 रखने वाला एक कक्षक $-\frac{1}{2}$ या $+\frac{1}{2}$ चक्रण क्वाण्टम संख्या मान रख सकता है। इसलिए, न्यूनतम तथा अधिकतम सम्भव मान क्रमशः 2 तथा 3 है।

33. $\lambda = \frac{h}{\sqrt{2mQV}}$

For graph λ v/s $\frac{1}{\sqrt{V}}$, slope will be $\frac{h}{\sqrt{2Qm}}$,

$\therefore$ slope $\propto \frac{1}{\sqrt{m}}$

Hence heavier is the particle, lesser is the slope.

हल. $\lambda = \frac{h}{\sqrt{2mQV}}$

λ v/s $\frac{1}{\sqrt{V}}$ ग्राफ के लिए, ढाल $\frac{h}{\sqrt{2Qm}}$ होगा।

$\therefore$ ढाल $\propto \frac{1}{\sqrt{m}}$

अतः कण भारी है, तो ढ़ाल कम होता है।

34. Molality = $\frac{\text{Number of moles of solute}}{\text{weight of solvent (in kg)}}$

If number of moles of solute = 1
weight of solvent = 1 kg
then, molality = 1, i.e., one molal
Glucose ($C_6H_{12}O_6$),

Molecular weight = 180

Number of moles = $\frac{180}{180} = 1$

Weight of water = 1 kg

Hence, molality of the solution is one.

हल. मोललता = $\frac{\text{विलेय के मोलों की सख्या}}{\text{विलायक का भार (kg में)}}$

यदि विलेय मोलों की संख्या = 1

विलायक का भार = 1 kg

तब, मोललता = 1, अर्थात् एक मोलल्

ग्लूकोस ($C_6H_{12}O_6$),

अणुसूत्र भार = 180

मोलों की संख्या = $\frac{180}{180} = 1$

जल का भार = 1 kg

अतः, एक विलेय की मोललता।

35. $3\ N_2H_5^+ + 2\ Cr_2O_7^{2-} + 13H^+ \longrightarrow 3N_2 + 4Cr^{3+} + 14H_2O$

36. $C = \sqrt{\frac{3RT}{M}}$

$\therefore \frac{C_{H_2}}{C_{O_2}} = \sqrt{\frac{M_{O_2}}{M_{H_2}}}$

at same temperature (समान ताप पर)

$C_{H_2} = 4\ C_{O_2}$

37. (III) $Z = 1 + \frac{Pb}{RT}$

38. Find equation required is given below,
आवश्यक समीकरणें नीचे दी गयी है –

$CO + H_2O \rightleftharpoons CO_2 + H_2$

$2CO + O_2 \rightleftharpoons 2CO_2$ .....(1)

$2H_2 + O_2 \rightleftharpoons 2H_2O$ .....(2)

(1) $\div 2$ $CO + \frac{1}{2}O_2 \rightleftharpoons$

$CO_2 \quad (k_1)^{1/2}$ .....(3)

Reverse (2) & $\div 2$

(2) को उल्टा करने पर तथा $\div 2$

$2H_2O \rightleftharpoons O_2 + 2H_2 \quad (k_2)^{1/2}$

$H_2O \rightleftharpoons \frac{1}{2}O_2 + H_2 \quad \left(\frac{1}{k_2}\right)^{\frac{1}{2}}$ ..... (4)

(3) + (4)

$CO + \frac{1}{2}O_2 \rightleftharpoons CO_2 \quad (k_1)^{1/2}$

$H_2O \rightleftharpoons \frac{1}{2}O_2 + H_2 \quad \left(\frac{1}{k_2}\right)^{\frac{1}{2}}$

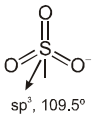
$CO + H_2O \rightleftharpoons CO_2 + H_2$

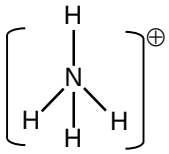
$k = \sqrt{k_1} \times \sqrt{\frac{1}{k_2}} = \sqrt{\frac{k_1}{k_2}}$

39. (2) A → Q, B → S, C → R, D → P

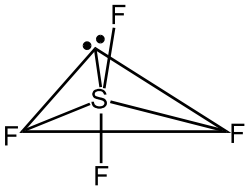
40. Maximum energy change = n_1 lowest and n_2 highest.
Energy of n = 5 = –0.544 eV
Energy of n = 4 = –o.85 ev
Energy of n = 3 = –1.51 ev
Energy of n = 2 = –3.4 ev
$n_3 - n_2$ = 1.89 eV
$n_4 - n_3$ = 0.66 eV
$n_4 - n_2$ = 2.856 eV
$n_5 - n_3$ = 0.966 eV
अधिकतम ऊर्जा परिवर्तन = n_1 न्यूनतम तथा n_2 उच्चतम
n की ऊर्जा = 5 = –0.544 eV
n की ऊर्जा = 4 = –o.85 ev
n की ऊर्जा = 3 = –1.51 ev
n की ऊर्जा = 2 = –3.4 ev
$n_3 - n_2$ = 1.89 eV
$n_4 - n_3$ = 0.66 eV
$n_4 - n_2$ = 2.856 eV
$n_5 - n_3$ = 0.966 eV

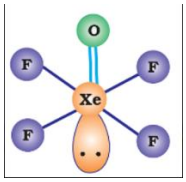
41. O=C=O(sp, 180º),



42. $NH_4^{\oplus}$  sp^3

$NO_2^{\oplus}$ $\overset{\oplus}{O} = N = O$ sp

SF_4  sp^3d

$XeOF_4 \Rightarrow$ 

sp^3d^2, square pyramidal

43. Option (A)

Element	ΔH_{eg} (KJ/mole)
F	–328
Cl	–349

So option (A) is incorrect.
Option (D) Be has higher ionization enthalpy than Al.

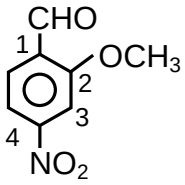
हल. विकल्प (A)

तत्व	ΔH_{eg} (KJ/mole)
F	–328
Cl	–349

विकल्प (A) गलत है।
विकल्प (D) Al की अपेक्षा Be की आयनन एन्थैल्पी अधिक है।

44. Methyl amine can give Lassaigne test of nitrogen.
मेथिल एमीन, नाइट्रोजन का लेसाने परीक्षण दे सकता है।

45. 1-Butyne is terminal alkyne and gives Tollen's and $Cu_2Cl_2 + NH_4OH$ test but 2-butyne is internal alkyne so it does not give the above tests.
1-Butyne is terminal alkyne and gives Tollen's and $Cu_2Cl_2 + NH_4OH$ test but 2-butyne is internal alkyne so it does not give the above tests.
1-ब्यूटाइन अन्तस्थ एल्काइन है एवं टॉलेन और $Cu_2Cl_2 + NH_4OH$ परीक्षण देता है लेकिन 2-ब्यूटाइन मध्यस्थ एल्काइन है इसलिये उपरोक्त परीक्षण नही देता है।

46. 

47. (4) a, c & d

48. Cations are smaller than neutral & as +ve charge ↑ the attraction ↑
$\therefore Al^{+3} > Al^{+2}$

हल. धनायन उदासीन की अपेक्षा छोटे होते हैं तथा जैसे ही +ve आवेश ↑ आकर्षण ↑
$\therefore Al^{+3} > Al^{+2}$

49. 

Functional isomers. (क्रियात्मक समावयवी)

Chain isomers (श्रृंखला समावयवी)

50. (2) Calcium chlorite
(2) कैल्शियम क्लोराइट

51. 70% W/W H_3PO_4
70g H_3PO_4 in 100g / cm^3
P = 1.5 g/ cm^3

$$M = \frac{70}{98} \times \frac{1000}{100} \times 1.54 = 11$$

$11 \times V = 1 \times 1000$
$V = 90.9 \approx 91$

हलः 70% W/W H_3PO_4
100g / cm^3 में 70g H_3PO_4
P = 1.5 g/ cm^3

$$M = \frac{70}{98} \times \frac{1000}{100} \times 1.54 = 11$$

$11 \times V = 1 \times 1000$
$V = 90.9 \approx 91$

52. The vander waals equation of state is :
(for 1 mole of gas)

$$\left(P + \frac{a}{V_m^2}\right)(V_m - b) = RT$$

When a is negligible, then

$$Z = \frac{pV_m}{RT} = 1 + \frac{b}{RT} P$$

that is Z increases with increaser in p.
when b is negligible, then

$$Z = \frac{pV_m}{RT} = 1 - \frac{a}{VRT}$$

increasing p implies decrease in V, which is turn, implies increase in the value of a/VRT and hence decrease in the value of Z.
The curve IV is applicable provided temperature of the gas is near but larger than it's critical temperature Hence, the choice (A), (B) and (C) are correct.

हल. वान्डर वॉल समीकरण, (1 मोल गैस के लिए)

$$\left(P + \frac{a}{V_m^2}\right)(V_m - b) = RT$$

जब 'a' नगण्य है, तब

$$Z = \frac{pV_m}{RT} = 1 + \frac{b}{RT} P$$

P बढ़ने के साथ Z भी बढ़ता है।
जब 'b' नगण्य है तब

$$Z = \frac{pV_m}{RT} = 1 - \frac{a}{VRT}$$

p बढाने पर V घटता है जो कि a/VRT को बढाता है जिससे Z के मान में कमी आती है।
वक्र IV लागू होगा यदि गैस का तापमान क्रांतिक ताप के समीप है परन्तु उससे अधिक है।
इसलिए (A), (B) व (C) सही है।

53. $P_1V_1 + P_2V_2 = P_fV_f$
$195 \times 3 + 530 \times 2 = p_f \times 5$
$P_f = 329$ Torr

54. In PV = nRT; P, V & R are same in this process
So, $n_1T_1 = n_2T_2$
$\Rightarrow 100 \times (273+27) = n_2 \times (273+447)$
(Taking initial 100 moles assumption)
$\Rightarrow n_2 = 41.66$
So amount expelled =
$(100 - 41.66)\% = 58.33\%$

हल. PV = nRT में ; इस प्रक्रम में P, V तथा R समान है
अतः, $n_1T_1 = n_2T_2$
$\Rightarrow 100 \times (273+27) = n_2 \times (273+447)$
(माना प्रारम्भ में 100 मोल लेने पर)
$\Rightarrow n_2 = 41.66$
अतः निष्कासित मात्रा =
$(100 - 41.66)\% = 58.33\%$

55. According to Gay Lussac's law, at constant volume, pressure of a gas $\propto$ temperature

Or $\frac{P}{T}$ = constant

At two different temperature

$\frac{P_1}{T_1} = \frac{P_2}{T_2}$

P_1 = 760 mm of Hg (At 273 K)
= 14.7 lb / sq. inch

T_1 = 273 K, T_2 = (160 + 273) K = 433 K

Now, $P_2 = P_1 \times \frac{T_2}{T_1} = \frac{147 \times 433}{273}$

= 23.3 lb / sq. inch

At 160°C, the pressure of air would be 23.3 lb / sq. inch.

Hence, valve should be set at 24 lb / sq. inch.

हल. नियत आयतन पर गेलूसेक नियम के अनुसार, गैस का दाब $\propto$ ताप

या $\frac{P}{T}$ = नियत

दो भिन्न ताप पर

$\frac{P_1}{T_1} = \frac{P_2}{T_2}$

P_1 = 760 mm Hg (273 K पर)
= 14.7 lb / sq. inch

T_1 = 273 K, T_2 = (160 + 273) K = 433 K

अब, $P_2 = P_1 \times \frac{T_2}{T_1} = \frac{147 \times 433}{273}$

= 23.3 lb / sq. inch

160°C पर, वायु का दाब 23.3 lb / sq. inch. होगा। इसलिए, वॉल्व 24 lb / sq. inch. पर व्यवस्थित होना चाहिए।

56. $CH_2=CH-CH_2-CH_3 \xrightarrow[Zn,H_2O]{O_3}$

$CH_2=O + CH_3-CH_2-CH=O$

$CH_3-CH=CH-CH_3 \xrightarrow[Zn,H_2O]{O_3}$

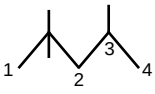
$CH_3-CH=O + CH_3-CH=O$

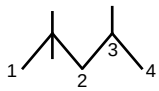
$CH_2=C(CH_3)_2 \xrightarrow[Zn,H_2O]{O_3}$

$CH_2=O + (CH_3)_2C=O$

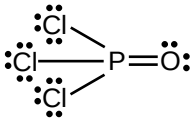
Total products = 4.

कुल उत्पाद = 4.

57.  Total four different type of hydrogen atoms are present in it, so total 4 monochloro structure isomers are formed.

 कुल विभिन्न चार प्रकार की हाइड्रोजन परमाणु उपस्थित हैं। अतः कुल 4 मोनोक्लोरो समावयवी प्राप्त होते है।

58. Only 1º Amines give carbylamine test.
केवल 1º एमीन कार्बिलएमीन परीक्षण देती है।

59. 

60. % sulphur

$= \frac{32}{233} \times \frac{\text{Weight of } BaSO_4 \text{ formed}}{\text{Weight of organic compound}} \times 100$

$= \frac{32}{233} \times \frac{1.4439}{0.471} \times 100 = 42.10$

PART-C: MATHEMATICS

61.

p	q	~ p	~ q	p → q	~ q → p	(p → q) ∨ (~ q → p)	p ∧ ~ q	~ p ∨ q	(p ∧ ~ q) ∧ (~ p ∨ q)
T	T	F	F	T	T	T	F	T	F
T	F	F	T	F	T	T	T	F	F
F	T	T	F	T	T	T	F	T	F
F	F	T	T	T	F	T	F	T	F

From table

$(p \to q) \vee (\sim q \to p)$ is tautology

and $(p \wedge \sim q) \wedge (\sim p \vee q)$ is fallacy

62. $^{21}C_0 + {}^{21}C_1 + {}^{21}C_2 + \ldots\ldots + {}^{21}C_{10} = \frac{2^{21}}{2} = 2^{20}$

63. $\log_{10} 2 = \beta$

$\log_{10}\left(\frac{1025}{1024} \times \frac{4}{4}\right) = \alpha$

$\Rightarrow \log_{10} 4100 - \log_{10} 2^{12} = \alpha$

$\Rightarrow \log_{10} 4100 = \alpha + 12\beta$

64. $T_n = n(2n+1)^2 = 4n^3 + 4n^2 + n$

$\therefore S_n = \sum_1^n T_n = \sum_1^n (4n^3 + 4n^2 + n)$

$= 4\sum_1^n n^3 + 4\sum_1^n n^2 + \sum_1^n n$

$= 4\left\{\frac{n}{2}(n+1)\right\}^2 + \frac{4}{6}n(n+1)(2n+1) + \frac{n}{2}(n+1)$

$= \frac{n}{6}(n+1)(6n^2 + 14n + 7)$

Trick : put n = 1 रखने पर, we get $T_1 = 9$

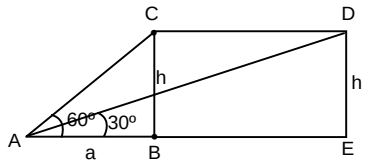
n = 2 रखने पर, we get $T_1 + T_2 = 59$

65. We know that only even prime is 2
समअभाज्य 2 है
then तब $(2)^2 - \lambda(2) + 12 = 0$
$\Rightarrow \lambda = 8$ and तथा $\lambda^2 = 4\mu \Rightarrow \mu = 16$

66. ~p : Rohan is not smart रोहन सुन्दर नहीं है।
~q : he is not poor वह गरीब नहीं है।

67. $\tan 60^\circ = \frac{h}{a} \Rightarrow a = \frac{h}{\sqrt{3}}$,

$BE = 432 \times \frac{20}{3600} = \frac{12}{5}$



$\tan 30^\circ = \frac{h}{\frac{h}{\sqrt{3}} + \frac{12}{5}} = \frac{1}{\sqrt{3}}$

$= \frac{h}{\frac{h}{\sqrt{3}} + \frac{12}{5}} = \frac{1}{\sqrt{3}}$

$\Rightarrow \sqrt{3}h = \frac{h}{\sqrt{3}} + \frac{12}{5}$

$\Rightarrow 15h = 5h + 12\sqrt{3} \Rightarrow h = \frac{12\sqrt{3}}{10} = \frac{6\sqrt{3}}{5}$

$km = 1200\sqrt{3}\ m$

68. $T_{r+1} = {}^{642}C_r 5^{\frac{642-r}{2}} . 7^{\frac{r}{6}}$
$r = 0, 6, 12, \ldots, 642 \Rightarrow$ total 108 terms.
$\Rightarrow$ कुल 108 पद

69. $\frac{6x^2 - 5x - 3}{x^2 - 2x + 6} - 4 \le 0$

$\Rightarrow \frac{2x^2 + 3x - 27}{x^2 - 2x + 6} \le 0$

denominator $x^2 - 2x + 6 > 0 \quad \forall \quad x \in R$
$(\because D < 0)$
then $2x^2 + 3x - 27 \le 0$
$\Rightarrow (2x + 9)(x - 3) \le 0$
$-\frac{9}{2} \le x \le 3 \Rightarrow 0 \le x^2 \le \frac{81}{4}$

$(4x^2)_{max} = 4\left(-\frac{9}{2}\right)^2 = 81$

$\Rightarrow (4x^2)_{min} = 4(0) = 0$

हल. $\frac{6x^2 - 5x - 3}{x^2 - 2x + 6} - 4 \le 0$

$\Rightarrow \frac{2x^2 + 3x - 27}{x^2 - 2x + 6} \le 0$

हर $x^2 - 2x + 6 > 0 \quad \forall \quad x \in R$
$(\because D < 0)$
तब $2x^2 + 3x - 27 \le 0$

$\Rightarrow (2x + 9)(x - 3) \le 0 - \frac{9}{2} \le x \le 3$

$\Rightarrow 0 \le x^2 \le \frac{81}{4}$ $(4x^2)_{\text{अधिकतम}} = 4\left(-\frac{9}{2}\right)^2 = 81$ $\Rightarrow (4x^2)_{\text{न्यूनतम}} = 4(0) = 0$

70. Number of ways to select atleast two persons
Total ways – No selection – 1 person selected
$= 2^{12} - 1 - 12 = 2^{12} - 13$
Required number of ways $= 2^{12} - 13 -$ (no boy selected) – (no girl selected)
$= 2^{12} - 13 - 2({}^6C_2 + {}^6C_3 + {}^6C_4 + {}^6C_5 + {}^6C_6)$
$= 2^{12} - 13 - 2(2^6 - 7) = 2^{12} - 2^7 + 1$

हल. कम से कम दो व्यक्ति चुनने के तरीके
= कुल तरीके – कोई चुनाव नहीं – 1 व्यक्ति का चुनाव
$= 2^{12} - 1 - 12 = 2^{12} - 13$
आवश्यक तरीकों की संख्या $= 2^{12} - 13 -$ (कोई लडके का चुनाव नहीं) – (कोई लडकी का चुनाव नहीं)
$= 2^{12} - 13 - 2({}^6C_2 + {}^6C_3 + {}^6C_4 + {}^6C_5 + {}^6C_6)$
$= 2^{12} - 13 - 2(2^6 - 7) = 2^{12} - 2^7 + 1$

71. If यदि $y \ne 0$, $4y^4 - 256y \ge 0$
$\Rightarrow 4y(y^3 - 64) \ge 0$
$\Rightarrow 4y(y - 4)(y^2 + 4y + 16) \ge 0$
$\Rightarrow y \in (-\infty, 0) \cup [4, \infty)$
as $y^2 + 4y + 16 > 0 \quad \forall y \in R$
Now, y = 0 is not possible as
then $x^2y + 2xy^2 + 64 = 0$
अब, y = 0 is सम्भव नही है
तब $x^2y + 2xy^2 + 64 = 0$
$\Rightarrow$ 64 = 0, not possible सम्भव नही

72. $f(x) = c\cos\alpha \sin x + c\sin\alpha \cos x$
$= c\sin(x + \alpha)$
$f(x) = 0 \Rightarrow x_1 + a = k_1\pi$, $k_1 \in I$
$x_1 - x_2 = (k_1 - k_2)\pi \Rightarrow x_1 - x_2 = n\pi, n \in I$

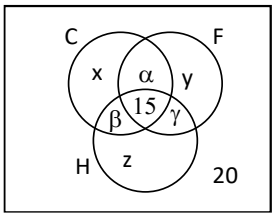
73. Greatest term in the expansion of $(1 + x)^{2n}$ is having greatest coefficient
if $x \in \left(\frac{n}{n+1}, \frac{n+1}{n}\right) \Rightarrow n = 9$
coefficient of x^5 in $(1 + x - 2x^2)^9$
$(1 + x - 2x^2)^9$ में x^5 का गुणांक
$= (1 + x + (-2x^2))^9$
$= \frac{9!(1)^{\alpha_1}(x)^{\alpha_2}(-2x^2)^{\alpha_3}}{\alpha_1!\alpha_2!\alpha_3!}$

α_1	α_2	α_3
6	1	2
5	3	1
4	5	0

$\boxed{\text{coeff} = 126}$

74. 2 can be taken in 2 ways (2^0 or 2^2)
2 को 2 तरीके से लिया जा सकता है (2^0 या 2^2)
3 can be taken in 3 ways (3^0 or 3^2 or 3^4)
3 को 3 तरीके से लिया जा सकता है
(3^0 या 3^2 या 3^4)
Similarly, 5 can be taken in 4 ways (5^0 or 5^2 or 5^4 or 5^6)
इसलिए 5 को 4 तरीके से लिया जा सकता है (5^0 या 5^2 या 5^4 या 5^6)
and 7 can be taken in 5 ways (7^0 or 7^2 or 7^4 or 7^6 or 7^8)
तथा 7 को 5 से तरीके से लिया जा सकता है (7^0 या 7^2 या 7^4 या 7^6 या 7^8)
Hence, total divisors which are perfect squares = 2.3.4.5 = 120
अतः कुल भाजक जो पूर्ण वर्ग है = 2.3.4.5 = 120

75.



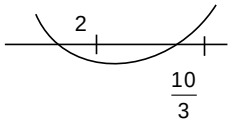
$15 + \alpha + \beta + \gamma = 40$
$15 + \alpha + \beta + \gamma + x + y + z + 20 = 100$

76. $\dfrac{2a+(m-1)d}{2a+(n-1)d} = \dfrac{3m+5}{2n+7}$

$\dfrac{t_m}{t_n} = \dfrac{a+(m-1)d}{a+(n-1)d} = \dfrac{2a+(2m-1-1)d}{2a+(2n-1-1)d} = \dfrac{3(2m-1)+5}{2(2n-1)+7} = \dfrac{6m+2}{4n+5}$

$\dfrac{6mn+18m+2n+6}{4n^2+12n+5n+15} = \dfrac{6m(n+3)+2(n+3)}{4n(n+3)+5(n+3)} = \dfrac{6m+2}{4n+5}$

77. Let $t = \dfrac{3x^2+4x+3}{x^2+x+1}$, $t \in \left[2, \dfrac{10}{3}\right]$, $t = 3$
$\Leftrightarrow x = 0$
$t^2 - \lambda t + 1 = 0$



$(5-2\lambda)\left(\dfrac{109}{9} - \dfrac{10\lambda}{3}\right) < 0 \Rightarrow \dfrac{5}{2} < \lambda < \dfrac{109}{30}$

$t = 3 \Rightarrow \lambda = \dfrac{10}{3}$

78. 10°, 50°, 130° are solutions of $\sin 3\theta = \dfrac{1}{2} \Rightarrow$
$8\sin^3\theta - 6\sin\theta + 1 = 0$
Sum = $\sin 10° + \sin 50° + \sin 130° = 0$
Product = $\sin 10° \sin 50° \sin 130° = -\dfrac{1}{8}$

79. $((2\alpha - 15)^2 + 4)((5\beta - 34)^2 + 3) = 12$
$\Rightarrow \quad 2\alpha = 15, \quad 5\beta = 34$
$x^{\left(\frac{2\alpha - 5\beta}{2}\right)} = x^{-\frac{19}{2}}$, $x^{(5\beta + 2\alpha)} = x^{49}$
$f(x) - \frac{x}{(1+x)} f(x) = (1+x)^{100} + x(1+x)^{99} + x^2(1+x)^{98} + ... + x - \frac{101x^{101}}{(1+x)}$
$f(x) = (1+x)^{102} - (1+x)\,x^{101} - 101x^{101}$.
coefficient of x^{49} is $^{102}C_{49}$
$f(1) = 2^{102} - 103$
$f\left(-\dfrac{1}{2}\right) = \dfrac{51}{2^{100}}$

80. $1 + 13 + 13^2 + 13^3 + ... + 13^{89} = (13^{45} + 1)$
$(13^4 + 13^3 + 13^2 + 13 + 1)(13^{10} + 13^5 + 1)$
$(13^{30} + 13^{15} + 1)$
$k = 15$

81. $x^x = 8^x . 2^{192} \Rightarrow \left(\dfrac{x}{8}\right)^x = 2^{192}$
$192 = 4 \times 4 \times 4 \times 3$
$\left(\dfrac{x}{8}\right)^x = \left(2^3\right)^{4\times4\times4} = 8^{8\times8}$
$\left(\dfrac{x}{8}\right)^{\frac{x}{8}} = 8^8 \Rightarrow \dfrac{x}{8} = 8 \Rightarrow x = 64$

82. We have दिया गया है, $\sin^3 x \sin 3x = \sum_{m=0}^{\infty} C_m \cos mx$
Now अब, $\sin^3 x \sin 3x = \dfrac{1}{4}(3\sin x - \sin 3x)\sin 3x$
$= \dfrac{3}{8} . 2\sin x \sin 3x - \dfrac{1}{8} . 2\sin^2 3x$
$= \dfrac{3}{8}(\cos 2x - \cos 4x) - \dfrac{1}{8}(1 - \cos 6x)$
$= -\dfrac{1}{8} + \dfrac{3}{8}\cos 2x - \dfrac{3}{8}\cos 4x + \dfrac{1}{8}\cos 6x$ ...(i)
RHS = $\sum_{m=0}^{n} C_m \cos mx = C_0 + C_1 \cos x + C_2 \cos 2x + C_3 \cos 3x + ... + C_n \cos nx$ ...(ii)

83. Number of terms in the exp. of $(1 + x + x^2 + x^3)^n = 3n+1$
$(1 + x + x^2 + x^3)^n$ के प्रसार में पदों की संख्या = $3n+1$
Number of terms in the exp. of $(x + y + z)^n = {}^{n+2}C_2$
$(x + y + z)^n$ के प्रसार में पदों की संख्या = $^{n+2}C_2$

$\Rightarrow$	$^{n+2}C_2$	=	$3n+1$
	$(n+2)(n+1)$	=	$6n+2$
	$n^2 + 3n + 2$	=	$6n+2$
	$n^2 = 3n$	$\Rightarrow$	$n = 0$ or या 3
	$\because \quad n \in N$	$\Rightarrow$	$n = 3$

84. $\tan x (\cot y + \cot z) + \tan y (\cot x + \cot z) + \tan z (\cot x + \cot y)$
$(\tan x \cot y + \tan y \cot x) + (\tan x \cot z + \cot x \tan z) + (\tan y \cot z + \cot y \tan z)$
$2 + 2 + 2 \geq 6$

85. $p \wedge q \to (r \vee q) \wedge ((p \wedge r) \to q))$
we know $p \to q \equiv \sim p \vee q$
Hence $(p \wedge r) \to q \equiv \sim(p \wedge r) \vee q$
$\equiv (\sim p \vee \sim r) \vee q$
$\Rightarrow p \wedge q \to (r \vee q) \wedge ((\sim p \vee \sim r) \vee q))$
$\Rightarrow \sim(p \wedge q) \vee (r \vee q) \wedge ((\sim p \vee \sim r) \vee q))$
$\Rightarrow (\sim p \vee \sim q) \vee (r \vee q) \wedge ((\sim p \vee \sim r) \vee q))$
$\Rightarrow (\sim p \vee (\sim q \vee r \vee q) \wedge ((\sim p \vee \sim r) \vee q))$
$\Rightarrow (\sim p \vee t) \wedge ((\sim p \vee \sim r) \vee q))$
$\Rightarrow \sim p \vee \sim r \vee q$
When $r = \sim p$ or $r = q \Rightarrow \sim p \vee \sim r \vee q = t$

86. Vowel $\longrightarrow$ I, U
consonents $\longrightarrow$ S, T, H, M, S.
Number of arangements = $2 ! \times \frac{5!}{2!} = 5 ! = 120$

हल. स्वर $\longrightarrow$ I, U
व्यंजन $\longrightarrow$ S, T, H, M, S.
व्यवस्थित करने के तरीके = $2 ! \times \frac{5!}{2!} = 5 ! = 120$

87. $(\log x)^2 - \log x - 2 \geq 0$
$x > 0$ ....(i)
$(\log x - 2)(\log x + 1) \geq 0$
$\Rightarrow \log x \leq -1$ or या $\log x \geq 2$
$\Rightarrow x \leq \frac{1}{10}$ or या $x \geq 100$ ....(ii)
(i) $\cap$ (ii) से $\Rightarrow x \in \left(0, \frac{1}{10}\right] \cup [100, \infty)$.

88. Let A be the k^{th} A.M., then H will be the k^{th} H.M.,
यदि kवाँ स. मा. A है तब H भी k वाँ ह.मा. अनुरूप होगा।
Now अब, $A = 2 + kd = 2 + k\left(\frac{3-2}{10}\right)$
$= \frac{20+k}{10}$
$\frac{1}{H} = \frac{1}{2} + kd' = \frac{1}{2} + k\frac{\left(\frac{1}{3} - \frac{1}{2}\right)}{10} = \frac{30-k}{60}$
$\therefore A + \frac{6}{H} = 5 \Rightarrow H(5 - A) = 6$

89. $7^{98} = (50 - 1)^{49} = {}^{49}C_0(50)^{49} - {}^{49}C_1(50)^{48} + \ldots\ldots - {}^{49}C_{49}$
Remainder शेषफल $= 5 - 1 = 4$

90. $x^2 + 2x + 6 = 0 \Rightarrow D < 0$
$\Rightarrow a, b \in R \Rightarrow$ both root must be in common दोनों मूल उभयनिष्ठ है।
$\frac{a}{1} = \frac{1}{2} = \frac{b}{6}$
$a = \frac{1}{2}, b = 3$
$b + 12a = 3 + 6 = 9$

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

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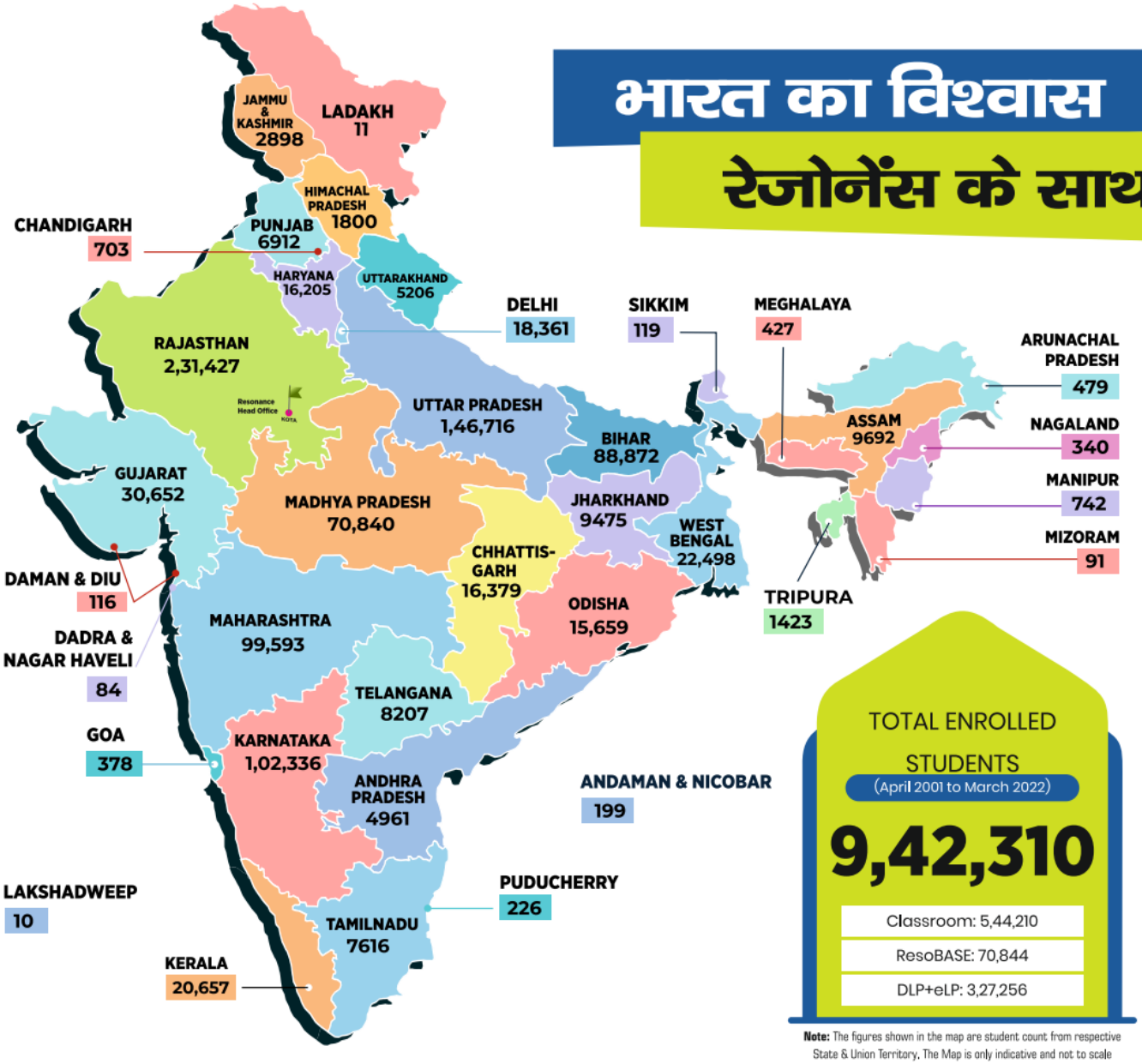
रेजोनेंस के साथ



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