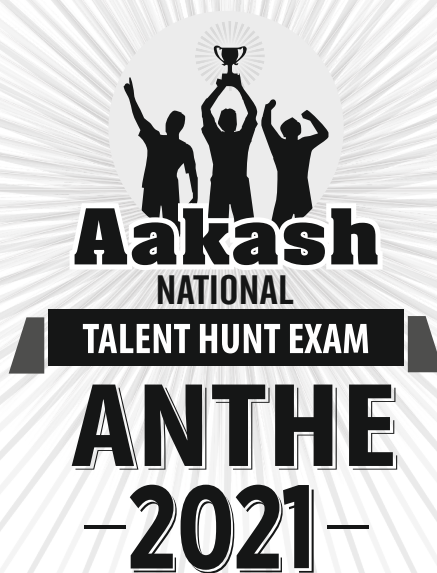


Sample Paper



(Class XII Studying moving to XII Passed)

Physics, Chemistry, Mathematics

INSTRUCTIONS FOR CANDIDATE

1. Duration of Test is 1 hr.
2. The Test booklet consists of **35** questions. The maximum marks are **90**. There is **no negative marking** for wrong answer.
3. Pattern of the questions are as under:
 - (i) This question paper consists of three parts i.e., Physics, Chemistry and Mathematics, each having **five sections**.
 - (ii) **Section-I:** This section contains **16** multiple choice questions, which have **only one** correct answer. Each question carries **+2 marks** for correct answer.
 - (iii) **Section-II:** This section contains **7** multiple choice questions, in which **more than one** answer may be correct. Each question carries **+4 marks** for correct answer.
 - (iv) **Section-III:** This section contains **6** multiple choice questions based on paragraphs, which have **only one** correct answer. Each question carries **+2 marks** for correct answer.
 - (v) **Section-IV:** This section contains **3** multiple choice questions based on assertion-reason type, which have **only one** correct answer. Each question carries **+2 marks** for correct answer.
 - (vi) **Section-V:** This section contains **3** questions. Each question has two matching Columns. Column-I has four entries (A, B, C, D) and Column-II has four entries (P, Q, R, S). Each entry in Column-I may match with one or more entries in Column-II. Each question carries **+4 marks** for correct answer.



Aakash National Talent Hunt Exam 2021

SAMPLE PAPER

(For Class XII Studying moving to XII Passed)

The questions given in sample paper are indicative of the level and pattern of questions that will be asked in ANTHE-2021)

Time : 1 Hour

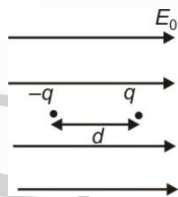
PHYSICS

MM : 90

SECTION-I : SINGLE ANSWER TYPE

This section contains 5 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4) out of which **ONLY ONE** is correct.

1. Two point charges q and $-q$ are placed in uniform electric field E_0 at a separation d as shown. If both of the charge particles are at equilibrium, then



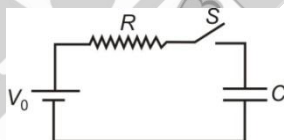
(1) $d = \sqrt{\frac{q}{\pi\epsilon_0 E_0}}$

(2) $d = \sqrt{\frac{q}{4\pi\epsilon_0 E_0}}$

(3) $d = \sqrt{\frac{2q}{\pi\epsilon_0 E_0}}$

(4) $d = \sqrt{\frac{q}{2\pi\epsilon_0 E_0}}$

2. For the RC circuit shown, switch 'S' is closed at time $t = 0$. Potential across capacitor is $\frac{V_0}{3}$ at time $t = t_0$. Value of t_0 is



(1) $RC \ln(3)$

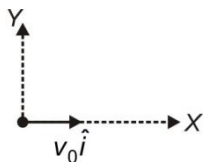
(2) $RC \ln(2)$

(3) $RC \ln\left(\frac{4}{3}\right)$

(4) $RC \ln\left(\frac{3}{2}\right)$

Space for Rough Work

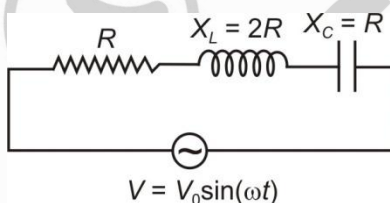
3. A charge particle (q, m) is projected with velocity $v_0 \hat{j}$ in uniform magnetic field $\vec{B} = B_0 \hat{j}$. If the particle is projected from the origin, then trajectory of particle would be



- (1) Straight line (2) Circular in X-Z plane
(3) Circular in X-Y plane (4) Circular in Y-Z plane
4. Current (I) flowing through a conductor varies with time (t) as $I = a - bt$, where a and b are positive constants. Charge flown through the conductor till current changes its direction, is

- (1) $\frac{a^2}{3b}$ (2) $\frac{2a^2}{b}$
(3) $\frac{a^2}{2b}$ (4) $\frac{a^2}{b}$

5. For a series LCR circuit shown, the current through the circuit is



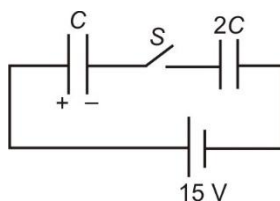
- (1) $\frac{V_0}{\sqrt{2}R} \sin\left(\omega t - \frac{\pi}{4}\right)$ (2) $\frac{V_0}{\sqrt{2}R} \sin\left(\omega t + \frac{\pi}{4}\right)$
(3) $\frac{2V_0}{\sqrt{5}R} \sin\left(\omega t - \frac{\pi}{4}\right)$ (4) $\frac{V_0}{\sqrt{5}R} \sin\left(\omega t + \frac{\pi}{4}\right)$

SECTION-II : MORE THAN ONE ANSWER TYPE

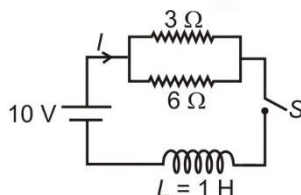
This section contains 2 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4) out of which **MORE THAN ONE** answer may be correct.

Space for Rough Work

6. For the circuit shown, initially capacitor C is charged to potential 5 V and capacitor $2C$ is neutral. Switch 'S' is closed at time $t = 0$.



- (1) Final potential across capacitor C is $\frac{35}{3}$ V (2) Final potential across capacitor C is $\frac{25}{3}$ V
 (3) Final potential across capacitor $2C$ is $\frac{10}{3}$ V (4) Final potential across capacitor $2C$ is $\frac{20}{3}$ V
7. For the circuit shown, switch 'S' is closed at time $t = 0$



- (1) Initial current through 3Ω is zero (2) Initial current through 3Ω is $\frac{5}{3}$ A
 (3) Current I at time $t = \ln 2$ s is $\frac{15}{4}$ A (4) Current I at time $t = \ln 2$ s is $\frac{5}{4}$ A

SECTION-III : PARAGRAPH TYPE

This section contains a paragraph. Based upon this paragraph, 2 multiple choice questions have to be answered. Each question has 4 choices (1), (2), (3) and (4), out of which **ONLY ONE** is correct.

Paragraph for Q. Nos. 8 & 9

Charge Q is distributed in spherical region of radius R in such a way that volume charge density (ρ) varies with radial distance (r) as $\rho = ar^2$, where a is positive constant.

8. Value of constant a is

- (1) $\frac{Q}{4\pi R^5}$ (2) $\frac{5Q}{4\pi R^5}$
 (3) $\frac{6Q}{5\pi R^5}$ (4) $\frac{3Q}{4\pi R^5}$

Space for Rough Work

9. Electric field at distance $\frac{R}{2}$ from center, is

(1) $\frac{Q}{16\pi\epsilon_0 R^2}$

(2) $\frac{3Q}{32\pi\epsilon_0 R^2}$

(3) $\frac{Q}{32\pi\epsilon_0 R^2}$

(4) $\frac{Q}{8\pi\epsilon_0 R^2}$

SECTION-IV : ASSERTION-REASON TYPE

This section contains 1 Assertion-Reason type question, which has 4 choices (1), (2), (3) and (4) out of which **ONLY ONE** is correct.

10. **A** : When two coils are wound on each other, the mutual inductance between the coils is maximum.

R : Mutual inductance does not depend on relative orientation of the coils.

- (1) Both (A) and (R) are true and (R) is the correct explanation of (A)
 (2) Both (A) and (R) are true but (R) is not the correct explanation of (A)
 (3) (A) is true but (R) is false
 (4) (A) is false but (R) is true

SECTION-V : MATRIX MATCH TYPE

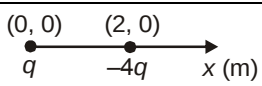
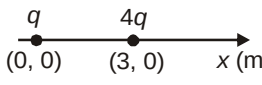
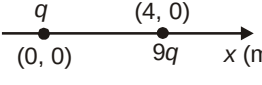
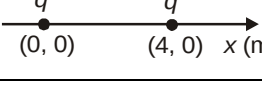
This section contains 1 Matrix Match type question, which has 2 Columns (Column-I and Column-II). Column-I has four entries (A), (B), (C) and (D), Column-II has four entries (P), (Q), (R) and (S). Match the entries in Column-I with the entries in Column-II. Each entry in Column-I may match with one or more entries in Column-II.

For each entry in Column-I, tick the boxes of all the matching entries in Column-II. For example, if entry (A) in Column-I matches with entries (P) & (S) in Column-II, then tick the boxes (P) & (S). Similarly, tick the boxes for entries (B), (C) and (D).

	P	Q	R	S
A.	☒	☐	☐	☒
B.	☐	☐	☐	☐
C.	☐	☐	☐	☐
D.	☐	☐	☐	☐

Space for Rough Work

11. Two point charges are placed on the x-axis are shown in Column-I. Column-II gives x-coordinate of the point where electric field due to these charges is zero. Match the entries of Column-I with the entries of Column-II.

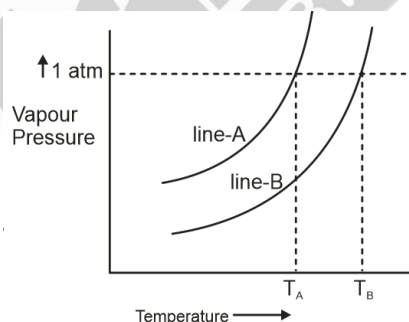
	Column-I		Column-II
(A)		(P)	$x = 1.0 \text{ m}$
(B)		(Q)	$x = -2.0 \text{ m}$
(C)		(R)	$x = 2.0 \text{ m}$
(D)		(S)	$x = 3.0 \text{ m}$

CHEMISTRY

SECTION-I : SINGLE ANSWER TYPE

This section contains 5 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4) out of which **ONLY ONE** is correct.

12. Compounds may have magnetic behaviour based upon the arrangement of electrons in it. Predict the magnetic behaviour of Cu^{2+} , Fe^{3+} and MnO respectively.
- (1) Paramagnetic, paramagnetic, diamagnetic (2) Paramagnetic, paramagnetic, anti-ferromagnetic
 (3) Diamagnetic, diamagnetic, anti-ferromagnetic (4) Ferromagnetic, ferrimagnetic, anti-ferromagnetic
13. Consider the following curves.

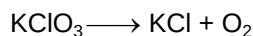


Space for Rough Work

Lines A and B represent the variation of vapour pressure of binary solutions A and B with temperature. Solutions A and B contain same solvent and solute. Identify the incorrect statement.

- (1) Solution B contains more percentage by mass of solute
- (2) Both solutions A and B have equal composition of solute
- (3) T_A is the boiling point of solution A
- (4) T_B is the boiling point of solution B

14. Consider the following reaction.



Which one of the following compounds is used as a catalyst for the given reaction?

- (1) MnO
- (2) MnO_2
- (3) Mn_2O_7
- (4) MnO_3

15. Which one of the following is the correct order for electronegativity of group-16 elements?

- (1) $\text{O} > \text{S} > \text{Po}$
- (2) $\text{S} > \text{Te} > \text{Se}$
- (3) $\text{Te} > \text{Po} > \text{Se}$
- (4) $\text{S} > \text{Po} > \text{Te}$

16. Consider the Mn^{+x} ion which is light pink in colour in aqueous phase. Identify the incorrect statement about Mn^{+x} .

- (1) The value of $x = 2$
- (2) The value of CFSE for the given ion in complexes is zero in presence of weak field ligands
- (3) Magnetic moment is zero
- (4) The value of $E_{\text{Mn}^{+(x+1)}/\text{Mn}^{+x}}^0$ is positive

SECTION-II : MORE THAN ONE ANSWER TYPE

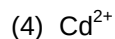
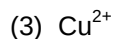
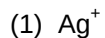
This section contains 2 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4) out of which **MORE THAN ONE** answer may be correct.

17. Identify the complexes which obey Sidgwick effective atomic number (EAN) rule.

- (1) $[\text{Fe}(\text{Cp})_2]$ (Cp is )
- (2) $[\text{Cr}(\text{C}_6\text{H}_6)_2]$
- (3) $[\text{Cr}(\text{NO})_4]$
- (4) $[\text{Fe}(\text{CO})_2(\text{NO})_2]$

Space for Rough Work

18. Identify the ions which give a soluble product in the presence of excess of aqueous KCN.



SECTION-III : PARAGRAPH TYPE

This section contains a paragraph. Based upon this paragraph, 2 multiple choice questions have to be answered. Each question has 4 choices (1), (2), (3) and (4), out of which **ONLY ONE** is correct.

Paragraph for Q. Nos. 19 & 20

Consider the gas phase reaction $\text{A} \rightarrow 5\text{B} + 2\text{C}$ occurring at a constant temperature in a fixed volume container. The variation of pressure with time is given as

Time (s)	0	100	∞
P_{total} (mmHg)	100	200	700

The reaction follows first order kinetics.

19. Identify the correct statement.

(1) Initially only A was present

(2) Initially only A and B were present

(3) All A, B and C were present initially in equal amount

(4) Only B and C were present initially

20. The rate constant of the reaction (in s^{-1}) is

(1) $\frac{1}{100} \ln \frac{5}{6}$

(2) $\frac{1}{100} \ln \frac{6}{5}$

(3) $\frac{1}{200} \ln \frac{5}{6}$

(4) $100 \ln \frac{6}{5}$

SECTION-IV : ASSERTION-REASON TYPE

This section contains 1 Assertion-Reason type question, which has 4 choices (1), (2), (3) and (4) out of which **ONLY ONE** is correct.

Space for Rough Work

21. **A** : Colour of a complex depends upon both nature of metal ion and nature of ligand.

R : Magnitude of CFSE depends upon both nature of metal ion and nature of ligand.

- (1) Both (A) and (R) are true and (R) is the correct explanation of (A)
 (2) Both (A) and (R) are true but (R) is not the correct explanation of (A)
 (3) (A) is true but (R) is false
 (4) (A) is false but (R) is true

SECTION-V : MATRIX MATCH TYPE

This section contains 1 Matrix Match type question, which has 2 Columns (Column-I and Column-II). Column-I has four entries (A), (B), (C) and (D), Column-II has four entries (P), (Q), (R) and (S). Match the entries in Column-I with the entries in Column-II. Each entry in Column-I may match with one or more entries in Column-II.

For each entry in Column-I, tick the boxes of all the matching entries in Column-II. For example, if entry (A) in Column-I matches with entries (P) & (S) in Column-II, then tick the boxes (P) & (S). Similarly, tick the boxes for entries (B), (C) and (D).

	P	Q	R	S
A.	☒	☐	☐	☒
B.	☐	☐	☐	☐
C.	☐	☐	☐	☐
D.	☐	☐	☐	☐

22. Column-I contains concentration cells and Column-II contains E_{cell}^0 or E_{cell} . Match Column-I and Column-II.

[HA and HB are weak acids] $\left(\text{Use, } \frac{2.303RT}{F} = 0.06 \right)$

	Column-I		Column-II
(A)	$\text{Pt} \text{H}_2 \text{HA} \parallel \text{H}^+ \text{H}_2 \text{Pt}$ $\begin{matrix} 2 \text{ atm} & 0.1 \text{ M} & 0.1 \text{ M} & 1 \text{ atm} \\ & K_a=10^{-5} & & \end{matrix}$	(P)	0
(B)	$\text{Pt} \text{H}_2 \text{HA} \parallel \text{HB} \text{H}_2 \text{Pt}$ $\begin{matrix} 1 \text{ atm} & 0.1 \text{ M} & 0.01 \text{ M} & 1 \text{ atm} \\ & K_a=10^{-5} & K_a=10^{-6} & \end{matrix}$	(Q)	0.13 V

Space for Rough Work

(C)	$\text{Pt} \text{H}_2 \text{HB} \parallel \text{H}^+ \text{H}_2 \text{Pt}$ 2 atm 0.01 M 0.1 M 2 atm $K_a=10^{-6}$	(R)	-0.06 V
(D)	$\text{Pt} \text{H}_2 \text{HA} \parallel \text{HB} \text{H}_2 \text{Pt}$ 2 atm 10^{-3} M 0.01 M 2 atm $K_a=10^{-5}$ $K_a=10^{-6}$	(S)	0.18 V

MATHEMATICS

SECTION-I : SINGLE ANSWER TYPE

This section contains 6 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4) out of which **ONLY ONE** is correct.

23. Let $A = \{1, 2, 3\}$. A relation $A \rightarrow A$ be defined as $R = \{(1, 1), (1, 2)\}$. The minimum number of elements that shall be added to R to make it equivalence is
- (1) Zero (2) 1
(3) 2 (4) 3
24. Let a function is defined as $f(x) = \frac{|x-1|-x}{x}$, then
- (1) Domain of $f(x)$ is R
(2) $f(x)$ is differentiable at $x = 1$
(3) $f(x)$ is non-differentiable at $x = 1$
(4) $f(x)$ is discontinuous at $x = 1$
25. Let $f(x) = |\sin 2x| + |\cos x|$, then $f'\left(\frac{\pi}{3}\right)$ equals
- (1) 1 (2) $\frac{\sqrt{3}}{2}$
(3) $1 + \frac{\sqrt{3}}{2}$ (4) $-1 - \frac{\sqrt{3}}{2}$

Space for Rough Work

26. The x-intercept of tangent to $y = \tan x$ at $\left(\frac{\pi}{4}, 1\right)$ is

(1) $\frac{\pi}{4}$

(2) $\frac{1}{2}$

(3) $\frac{\pi}{4} - \frac{1}{2}$

(4) $\frac{\pi}{4} + \frac{1}{2}$

27. $\int \frac{\cot x}{\sqrt{\sin x}} dx$ equals

(1) $\frac{2}{\sqrt{\sin x}} + c$

(2) $\frac{-2}{\sqrt{\sin x}} + c$

(3) $\frac{-2}{\sqrt{\cos x}} + c$

(4) $\frac{2}{\sqrt{\cos x}} + c$

28. $\int_{-1}^1 |x^3 - x| dx$ equals

(1) $\frac{11}{4}$

(2) $\frac{1}{2}$

(3) $-\frac{1}{2}$

(4) $-\frac{11}{4}$

SECTION-II : MORE THAN ONE ANSWER TYPE

This section contains 3 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4) out of which **MORE THAN ONE** answer may be correct.

29. The area (in sq. units) bounded by the curve $y^2 = 4x$, x-axis and $x = 1$ is greater than (given, $y > 0$)

(1) $\frac{1}{3}$

(2) $\frac{2}{3}$

(3) 1

(4) $\frac{4}{3}$

Space for Rough Work

30. The set of value(s) of x for which $f(x) = \frac{x^2 - x + 1}{x^2 + x + 1}$ is monotonically increasing, is

- (1) $x \in \mathbb{R}$ (2) $x \in (-\infty, -1)$
 (3) $x \in (1, \infty)$ (4) $x \in (-1, 1)$

31. If $A = \begin{bmatrix} 2 & 1 \\ 4 & 3 \end{bmatrix}$ then

- (1) $\det(A^{-1})$ is 2 (2) $\det(\text{adj}(A)) = 2$
 (3) $\det(A^{-1})$ is $\frac{1}{2}$ (4) $\det(\text{adj}(A)) = \frac{1}{2}$

SECTION-III : PARAGRAPH TYPE

This section contains a paragraph. Based upon this paragraph, 2 multiple choice questions have to be answered. Each question has 4 choices (1), (2), (3) and (4), out of which **ONLY ONE** is correct.

Paragraph for Q. Nos. 32 & 33

The radius of a sphere is increasing at the rate of 4 cm/s. Then

32. The rate by which its surface area increases, when $r = 5$ cm, is

- (1) $80\pi \text{ cm}^2/\text{s}$ (2) $100\pi \text{ cm}^2/\text{s}$
 (3) $160\pi \text{ cm}^2/\text{s}$ (4) $400\pi \text{ cm}^2/\text{s}$

33. The rate by which its volume increases, when $r = 5$ cm, is

- (1) $80\pi \text{ cm}^3/\text{s}$ (2) $100\pi \text{ cm}^3/\text{s}$
 (3) $160\pi \text{ cm}^3/\text{s}$ (4) $400\pi \text{ cm}^3/\text{s}$

SECTION-IV : ASSERTION-REASON TYPE

This section contains 1 Assertion-Reason type question, which has 4 choices (1), (2), (3) and (4) out of which **ONLY ONE** is correct.

34. **A** : $\tan(\tan^{-1}x) = x, \forall x \in \mathbb{R}$.

R : Domain of $\tan^{-1}x$ is $\mathbb{R}$.

- (1) Both (A) and (R) are true and (R) is the correct explanation of (A)
 (2) Both (A) and (R) are true but (R) is not the correct explanation of (A)
 (3) (A) is true but (R) is false
 (4) (A) is false but (R) is true

Space for Rough Work

SECTION-V : MATRIX MATCH TYPE

This section contains 1 Matrix Match type question, which has 2 Columns (Column-I and Column-II). Column-I has four entries (A), (B), (C) and (D), Column-II has four entries (P), (Q), (R) and (S). Match the entries in Column-I with the entries in Column-II. Each entry in Column-I may match with one or more entries in Column-II.

For each entry in Column-I, tick the boxes of all the matching entries in Column-II. For example, if entry (A) in Column-I matches with entries (P) & (S) in Column-II, then tick the boxes (P) & (S). Similarly, tick the boxes for entries (B), (C) and (D).

	P	Q	R	S
A.	☒	☐	☐	☒
B.	☐	☐	☐	☐
C.	☐	☐	☐	☐
D.	☐	☐	☐	☐

35. Match the entries of Column-I with those of Column-II.

	Column-I		Column-II
(A)	The value of $\int_0^{\pi/2} \frac{\sin^{2020} x}{\sin^{2020} x + \cos^{2020} x} dx$ is	(P)	$\frac{\pi}{2}$
(B)	The x-coordinate of point of minima of $f(x) = 4x^2 - \pi x + 1$ is	(Q)	$\frac{\pi}{4}$
(C)	The value of determinant of matrix $\begin{bmatrix} \pi & \pi \\ \frac{1}{3} & \frac{1}{2} \end{bmatrix}$ is	(R)	$\frac{\pi}{6}$
(D)	The value of $\sin^{-1} \frac{\sqrt{3}}{2} + \cos^{-1} \frac{\sqrt{3}}{2} - \tan^{-1} 1$ is	(S)	$\frac{\pi}{8}$

☐ ☐ ☐

Space for Rough Work



Aakash
+  **BYJU'S**

33 Year Old Legacy of Delivering Outstanding Results



84230 NEET-UG 2020

69759 Classroom + 14471 Digital & Distance



1700 JEE (Advanced) 2020

(1560 Classroom + 140 Digital & Distance)



JEE (Main) 2021 PHASE-III



Our Result in Scholarship Exams /Olympiads

949 NTSE (Stage-I) 2019-2020

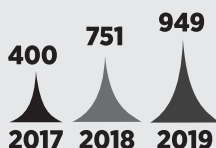
832 Classroom +
117 Digital & Distance

Our 1st Rankers from Classroom Programs

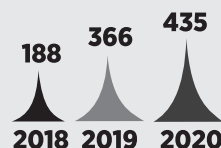


Our performance in Olympiads & Scholarship Exams Over Past 3 Years

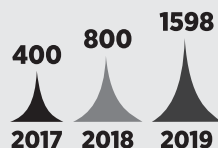
NTSE Stage-I



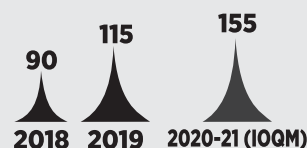
NTSE Stage-II



PRMO



RMO



AAKASHIANS OUTSHINE IN CBSE CLASS X BOARD EXAM 2020

Glimpse of our top performers



1598

1556 Classroom +
42 Digital & Distance

PRMO
2019

155

151 Classroom +
04 Digital & Distance

IOQM
2020-21

620

533 Classroom +
87 Digital & Distance

KVPY Aptitude
Test 2019

521

435 Classroom +
86 Digital & Distance

KVPY Fellowship
Award 2020-21

771

705 Classroom +
66 Digital & Distance

NSEs
2019

1611

1477 Classroom +
134 Digital & Distance

IMO (Level-I)
2020-21

1656

1528 Classroom +
128 Digital & Distance

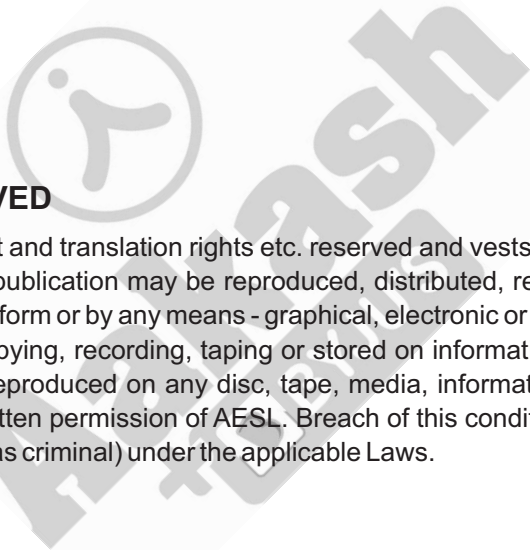
NSO (Level-I)
2020-21

26

20 Classroom +
06 Digital & Distance

INO
2020

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Edition: 2021-22