

# Sample Paper

ENGINEERING



**(Class X Studying Moving to Class XI)**

**Physics, Chemistry, Mathematics & Mental Ability**

## 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 four parts (Physics, Chemistry, Mathematics and Mental Ability). P, C, M have **four sections** and Mental Ability has **two sections**.
  - (ii) **Section-I:** This section contains **22** 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 **3** multiple choice questions based on assertion & reason type, which have **only one** correct answer. Each question carries **+2 marks** for correct answer.
  - (v) **Section-IV:** 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 entry in Column-II. Each question carries **+4 marks** for correct answer.





# Aakash National Talent Hunt Exam 2021

## Sample paper

### (Class X Studying Moving to Class XI)

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

Time : 1 Hour

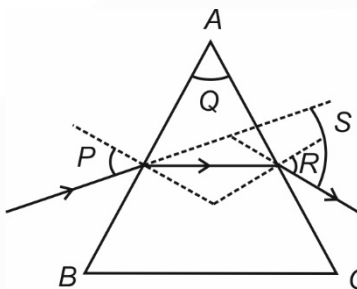
MM : 90

## PHYSICS

### 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. On reducing the focal length of a lens, its power
  - (1) Decreases
  - (2) Increases
  - (3) Remains unchanged
  - (4) May increase or decrease
2. The refraction of a white light through a glass prism is shown below. Identify the angles  $P$ ,  $Q$ ,  $R$  and  $S$ .



	$P$	$Q$	$R$	$S$
(1)	Angle of incidence	Angle of prism	Angle of deviation	Angle of emergence
(2)	Angle of emergence	Angle of prism	Angle of incidence	Angle of deviation
(3)	Angle of incidence	Angle of deviation	Angle of prism	Angle of emergence
(4)	Angle of incidence	Angle of prism	Angle of emergence	Angle of deviation

Space for Rough Work

3. In an experiment of verification of Ohm's law, the following observations are obtained.

Potential difference $V$ (in volt)	0.25	0.5	0.75	1.00	1.25
Current $I$ (in ampere)	0.1	0.2	0.3	0.4	0.5

The value of current  $I$  when potential difference  $V$  is 0.85 V, is

- (1) 0.32 A (2) 0.34 A  
(3) 0.36 A (4) 0.38 A
4. The resistivity of a wire is proportional to its length as
- (1)  $\frac{1}{l}$  (2)  $l^2$   
(3)  $\frac{1}{l^2}$  (4)  $l^0$
5. Figure below shows an object  $OA$  and its image  $IB$  formed by a concave lens. The possible position of lens could be

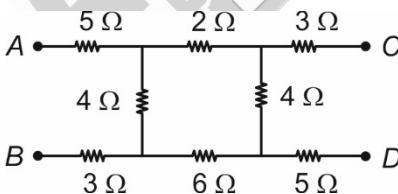


- (1) In the left of object  $OA$  (2) In the right of image  $IB$   
(3) In between object  $OA$  and image  $IB$  (4) Either left of object  $OA$  or in the right of image  $IB$

### 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.

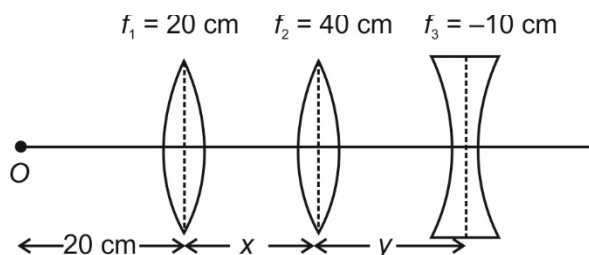
6. Eight resistors are connected in a circuit as shown below. If  $R_{xy}$  represents equivalent resistance between any points  $x$  and  $y$  then



- (1)  $R_{AB} = R_{CD}$  (2)  $R_{AC} = R_{BD}$   
(3)  $R_{AC} = R_{BC}$  (4)  $R_{BD} = R_{AD}$

Space for Rough Work

7. Two convex lenses of focal lengths 20 cm and 40 cm and a concave lens of focal length 10 cm are placed as shown below. An object is placed at a distance of 20 cm. The value of  $x$  and  $y$ , for which final rays comes out parallel to the principal axis, are



- (1)  $x = 20 \text{ cm}$ ,  $y = 40 \text{ cm}$
- (2)  $x = 20 \text{ cm}$ ,  $y = 30 \text{ cm}$
- (3)  $x = 15 \text{ cm}$ ,  $y = 30 \text{ cm}$
- (4)  $x = 30 \text{ cm}$ ,  $y = 20 \text{ cm}$

### SECTION-III : 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.

8. **A** : The sun and the region around sun appear reddish at the time of sunrise and sunset.

**R** : At the time of sunrise and sunset most of the blue colour of white light is scattered. Therefore, maximum red colour of light reaches to our eyes.

- (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-IV : 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.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
B.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9. Match the Columns.

Column I	Column II
(A) Conductors of electricity	(P) Tungsten
(B) Alloys	(Q) Nichrome
(C) Insulator	(R) Glass
(D) Filament of bulb is made of	(S) Copper

Space for Rough Work

**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.

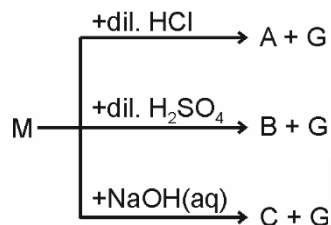
10. Hydrogen sulphide gas reacts with oxygen gas to form solid sulphur and water. Which of the following statements is true about this reaction?

- (1) The given reaction is an example of combination reaction
- (2) Hydrogen sulphide gas is being oxidised
- (3) The given reaction is an example of double displacement reaction
- (4) Oxygen gas is being oxidised

11. On balancing the given equation,  $a\text{MnO}_2(\text{s}) + b\text{Al}(\text{s}) \longrightarrow c\text{Mn}(\text{l}) + d\text{Al}_2\text{O}_3(\text{s})$ , the value of a, b, c and d will be

- (1) 1, 2, 1 and 1
- (2) 2, 3, 2 and 3
- (3) 3, 4, 3 and 2
- (4) 2, 2, 2 and 1

12. Consider the following



If 'G' is a gas which burns with a pop sound, then identify the compounds A, B and C and choose the correct option.

- (1) A =  $\text{CuCl}_2$ , B =  $\text{CuSO}_4$  and C =  $\text{Na}_2\text{Cu}(\text{OH})_2$
- (2) A =  $\text{ZnCl}_2$ , B =  $\text{ZnSO}_4$  and C =  $\text{Zn}(\text{OH})_2$
- (3) A =  $\text{CuCl}_2$ , B =  $\text{CuSO}_4$  and C =  $\text{Cu}(\text{OH})_2$
- (4) A =  $\text{ZnCl}_2$ , B =  $\text{ZnSO}_4$  and C =  $\text{Na}_2\text{ZnO}_2$

13. Which of the following salts has two water molecules present in its one formula unit?

- (1) Gypsum
- (2) Plaster of Paris
- (3) Washing soda
- (4) Baking soda

Space for Rough Work

14. Aqueous solution of barium chloride reacts with aqueous solution of aluminium sulphate to produce
- (1) Aqueous solution of barium sulphate
  - (2) White precipitate of barium sulphate
  - (3) Yellow precipitate of barium sulphate
  - (4) Blue coloured solution of barium sulphate

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**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.

15. Aqueous solution of which of the following turn(s) pink on addition of few drops of phenolphthalein?
- (1) Lemon juice
  - (2) Milk of magnesia
  - (3) Pure water
  - (4) Sodium hydroxide
16. Which of the following statements is/are correct?
- (1) Iron nail reacts with steam to evolve  $H_2$  gas
  - (2) Magnesium ribbon can react with cold water to evolve  $H_2$  gas
  - (3) Silver reacts with oxygen but does not react with water
  - (4) Gold does not react with oxygen or water even at high temperature

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**SECTION-III : 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.

17. **A** : Alkali metals like lithium, sodium, potassium etc. are so soft that they can be cut with a knife.  
**R** : Alkali metals have high densities and low melting points.
- (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

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Space for Rough Work



**SECTION-IV : 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.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
B.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

18. Match the Column-I with Column-II.

Column I	Column II
(A) Sodium chloride	(P) Acidic salt
(B) Potassium nitrate	(Q) Basic salt
(C) Sodium acetate	(R) Neutral salt
(D) Aluminium chloride	(S) pH value more than 7

**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.

19.  $C$  and  $D$  are the points lying on line segment  $AB$  such that  $AC = CD = DB$ . If  $A(-5, 4)$  and  $B(9, -2)$ , then mid-point of  $CD$  is

- |               |                                   |
|---------------|-----------------------------------|
| (1) $(0, 0)$  | (2) $(2, 1)$                      |
| (3) $(-2, 1)$ | (4) $\left(1, \frac{1}{2}\right)$ |

Space for Rough Work

20. If quadratic equation  $x^2 + ax + \frac{b}{4} = 0$  has rational roots such that  $a$  and  $b$  are positive integers less than 6, then number of possible pairs of  $(a, b)$  is
- (1) 4 (2) 5  
(3) 6 (4) 7
21. **Statement I :**  $(7 \times 3 \times 5 \times 4 \times 2 + 14)$  is a composite number.  
**Statement II :** If  $x$  and  $y$  are prime numbers greater than 2, then  $(x + y)$  is an odd number.  
**Statement-III :**  $25^n$  for any positive integer  $n$  will always ends with 5.
- (1) Only statement I is correct (2) Only statement III is correct  
(3) All statements I, II and III are correct (4) Both statements I and III are correct
22. In  $\triangle ABC$ ,  $P(-4, 2)$ ,  $Q(1, 1)$  and  $R(-2, 6)$  are the mid points of  $AB$ ,  $BC$  and  $AC$  respectively. Then, the perimeter of  $\triangle ABC$  is
- (1)  $(2\sqrt{5} + 2\sqrt{34} + \sqrt{26})$  units (2)  $(4\sqrt{5} + \sqrt{34} + 2\sqrt{26})$  units  
(3)  $(4\sqrt{5} + 2\sqrt{34} + 2\sqrt{26})$  units (4)  $(2\sqrt{5} + \sqrt{34} + \sqrt{26})$  units
23. Lines  $kx + (k + 3)y = 7$  and  $(k + 4)x + (7k + 1)y = 10$  represent opposite sides of a parallelogram, then the value of  $k$  can be
- (1)  $\frac{4}{3}$  (2) 1  
(3) 2 (4) -2
24. In an A.P., if  $S_n = n(5n + 2)$ , then its 5<sup>th</sup> term is
- (1) 47 (2) 33  
(3) -47 (4) -33

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Space for Rough Work

**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.

25. Side  $CB$  of a right triangle right angled at  $B$  is extended to  $D$ .  $G$  and  $F$  are points on  $AB$  and  $AC$  respectively such that  $GF \parallel BC$  and  $DF$  intersects  $AB$  at  $E$ , then which of the following option(s) is/are correct?
- (1)  $\triangle GFE \sim \triangle BED$  (2)  $AG \times CF = BG \times AF$
- (3)  $\frac{AG}{AB} = \frac{GF}{BC}$  (4)  $AE \left( \frac{AB + AG}{AB \cdot AG} \right) = 2$
26. If  $a, b, c$  and  $d$  are zeroes of the polynomial  $p(x) = x^4 - 8x^3 + 14x^2 + 8x - 15$  such that  $a < b < c < d$ , then the correct option(s) is/are
- (1)  $a + d = b + c$
- (2) If  $a, b, c, d, \dots$  form a sequence, then its 10<sup>th</sup> term is 17
- (3)  $p(5) = p(3)$
- (4) Two zeroes of  $p(x)$  are equal

**SECTION-III : 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.

27. **A :** The sum  $5 - \frac{1}{n} + 5 - \frac{2}{n} + 5 - \frac{3}{n} + \dots$  up to  $n$ -terms is equal to  $\frac{9n-1}{2}$

**R :** Sum of the first  $n$  natural numbers  $= \frac{n(n+1)}{2}$

- (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
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Space for Rough Work

**SECTION-IV : MATRIX MATCH TYPE**

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	P	Q	R	S
A.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
B.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

28. Match the Column-I with Column-II.

Column I	Column II
(A) $\frac{1}{\sin \theta} - \frac{\sin \theta}{\tan^2 \theta + \sin \theta \tan^2 \theta}$ equals	(P) 2
(B) The value of $(1 + \cot^2 \theta)(1 - \cos \theta)(1 + \cos \theta)$ is	(Q) $\sec^2 \theta - \tan^2 \theta$
(C) $\left( \frac{\sin^2 \theta}{1 + \cos \theta} + \cos \theta + 1 \right)$ equals	(R) $\operatorname{cosec}^2 \theta - \cot^2 \theta + 1$
(D) The value of $\sin 45^\circ \cos 45^\circ + \cos 30^\circ \cot 30^\circ$ is	(S) 1

Space for Rough Work

**MENTAL ABILITY****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.

29. The next term in the following pattern is

49, 925, 2549, 49121, 121169, ?

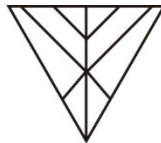
(1) 289361

(2) 169289

(3) 169361

(4) 289169

30. The total number of triangles in the following figure is



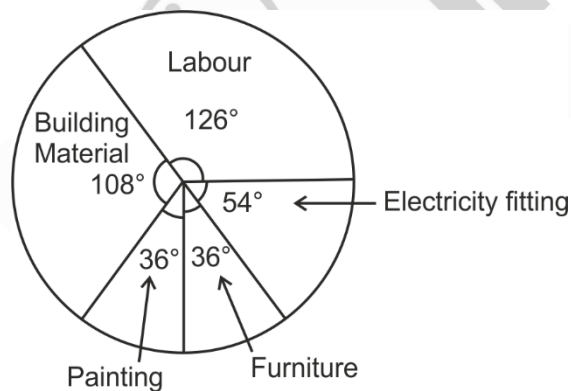
(1) 9

(2) 10

(3) 11

(4) 12

31. Study the given data and answer the following question.



Components of construction of a building

If the total cost of construction of building is ₹ 10,00,000 then cost of painting is

(1) ₹ 360000

(2) ₹ 36000

(3) ₹ 10000

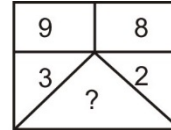
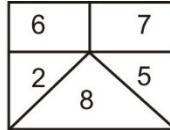
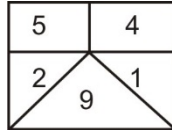
(4) ₹ 100000

Space for Rough Work

32. If MAT  $\rightarrow$  270341, RAM  $\rightarrow$  370327 and ZEN  $\rightarrow$  531129, then TOM  $\rightarrow$  ?

- (1) 413127  
(2) 412127  
(3) 513127  
(4) 413128

33. Choose the correct number in place of '?'.



- (1) 16  
(2) 25  
(3) 36  
(4) 49

34. Choose odd number from the following group.

89, 97, 73, 71, 61, 53, 49, 37, 31

- (1) 49  
(2) 89  
(3) 61  
(4) 97

### SECTION-II : MORE THAN ONE ANSWER TYPE

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

35. Choose correct pair/s in place of '?'

234 : 18 :: 456 : 50 :: ?.

- (1) 555 : 125  
(2) 222 : 8  
(3) 333 : 27  
(4) 666 : 72

☐ ☐ ☐

Space for Rough Work



# 33 Year Old Legacy of Delivering Outstanding Results



## 84230 NEET-UG 2020

69759 Classroom + 14471 Digital & Distance

**Akanksha Singh**  
4 Year Classroom

Perfect Score  
**720**  
**720**

**AIR 2**

**Snikitha Tummala**  
4 Year Classroom

**715**  
**720**

**AIR 3**

## 1700 JEE (Advanced) 2020

(1560 Classroom + 140 Digital & Distance)

**Chirag Falor**  
4 Year Classroom

Highest Scorer  
**352**  
**396**

**AIR 1**

**Aditya Goel**  
4 Year Classroom

**AIR 65**

## JEE (Main) 2021 PHASE-III

**Pravara Kataria**  
5 Year Classroom

**100**  
PERCENTILE

**Anmol Arichwal**  
4 Year Classroom

**100**  
PERCENTILE

## Our Result in Scholarship Exams /Olympiads

### 949 NTSE (Stage-I) 2019-2020

832 Classroom +  
117 Digital & Distance

Our 1st Rankers from Classroom Programs

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Delhi

**Tanishka**  
Haryana

**Dev Elvis Kannath**  
Kerala

**Sriansh Das**  
UP

**Jiya Kejriwal**  
UP

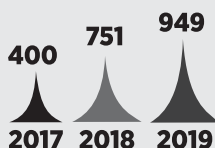
**Supratik Chattopadhyay**  
Assam

**Sakshi Hangargekar**  
Goa

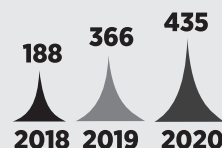
**Ojaswi Phal Desai**  
Goa

## Our performance in Olympiads & Scholarship Exams Over Past 3 Years

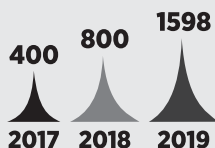
### NTSE Stage-I



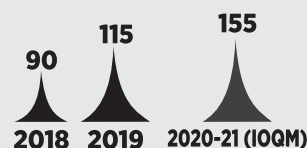
### NTSE Stage-II



### PRMO



### RMO



## AAKASHIANS OUTSHINE IN CBSE CLASS X BOARD EXAM 2020

Glimpse of our top performers

**P Harini**  
99.8% (499/500)

**Rishit Agarwal**  
99.6% (498/500)

**Sneha Barman**  
99.4% (497/500)

### 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

**Corporate Office :** Aakash Tower, 8, Pusa Road, New Delhi-110005. Phone : (011) 47623456





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