



MAHARASHTRA SCIENCE TALENT SEARCH EXAMINATION

for students of Class X

Time: 3 Hours

Maximum Marks: 270

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- **Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.**
 - **You are not allowed to leave the examination hall before end of the test.**
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INSTRUCTIONS

Note:

- The question paper contains 3 Parts
- **PART – 1** contains 30 questions of **IQ**
- **PART – 2** contains 1- 15 questions of **Physics** and 16-30 questions of **Chemistry**
- **PART – 3** contains 30 questions of **Mathematics**
- All are multiple choice questions. Each question has four choices (A), (B), (C) and (D), out of which only one is correct.

Marking Scheme:

- For each question, in all the three parts, you will be awarded **3 marks** if you have darkened only the bubble corresponding to the correct answer, **zero marks** for not darkening any bubble and in all other cases **minus one (-1) mark** will be awarded.

Name of the Candidate : _____

Test Centre : _____

PART – 1 - I.Q

Directions: (Question No. : 1 to 5) In each of the questions below out of the given four alternatives (a), (b), (c) and (d), which one of the alternatives is odd?

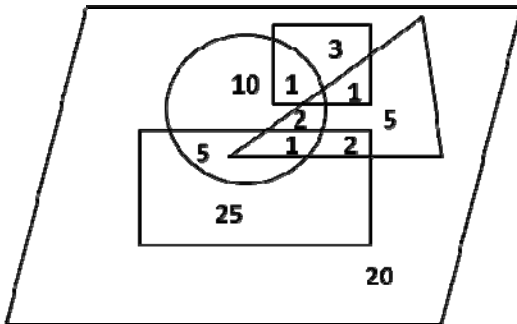
1. (A) 3731 (B) 3063 (C) 7357 (D) 4129
2. (A) year 2004 (B) year 1900 (C) year 1824 (D) year 1964
3. (A) D (B) Z (C) M (D) V
4. (A) Carrot (B) Beet (C) Radish (D) Sweet Potato
5. (A) Aristotle (B) Newton (C) Whittaker (D) Linnaus

Directions: (Question No. 6 to 10) Series Question.

6. J 2 Z, K 4 X, I 7 V, ?, H 16 R, M 22 P
(A) I 11 T (B) L 11 S (C) L 12 T (D) L 11 T
7. 1, 4, 3, 6, 7, 8, 15, ?
(A) 16 (B) 13 (C) 14 (D) 10
8. 55, 168, 57, 120, 60, 80, 62, 48, 65, 24, ?, ?
(A) 69, 11 (B) 67, 8 (C) 8, 71 (D) 6, 72
9. 11, 23, 48, 99, ?
(A) 202 (B) 102 (C) 212 (D) 216
10. Z, ?, T, ?, N, ?, H, ?, B
(A) W, Q, K, E (B) W, R, K, E (C) X, Q, K, E (D) X, R, K, E

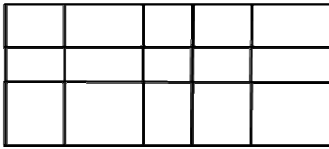
Directions : (Question 11 to 15)

Parallelogram represents All professionals living in a society, circle represents females, Square represents Doctors, Triangle represents Lawyers & Rectangle represents Engineers.



11. The number of people who are lawyers?
(A) 10 (B) 9 (C) 11 (D) 8
12. The number of Engineers who have another professional degree?
(A) 4 (B) 2 (C) 5 (D) 3
13. The number of women professionals who are neither Doctors nor Engineers?
(A) 14 (B) 9 (C) 10 (D) 12
14. Total number of professionals who do not have law degree or medicine degree?
(A) 50 (B) 45 (C) 60 (D) 55
15. The numbers of people without degree in Medical, Engineering or Law.
(A) 25 (B) 30 (C) 45 (D) 20

16. The no. of rectangle in the following figure (where every row is parallel to every other row and every column is parallel to every other column) is

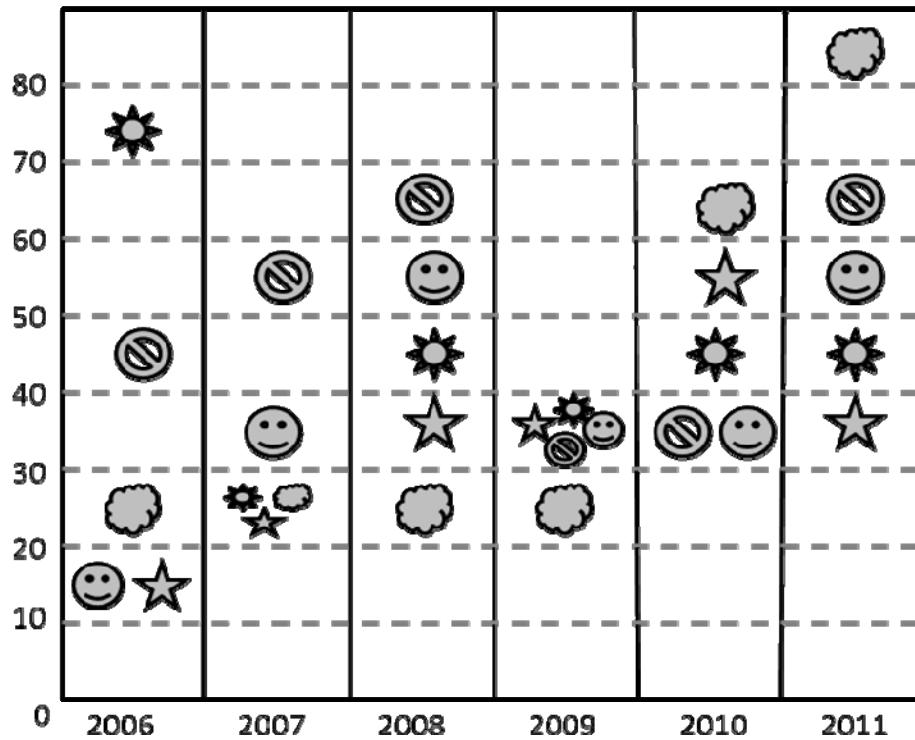


- (A) 90 (B) 75 (C) 60 (D) 55

17. There are 7 points in a given plane four in one straight line three in another. If both lines are parallel to each other how many triangles can be formed from the given point.
 (A) 48 (B) 30 (C) 40 (D) 36

Directions: (Question No. 18 to 24)

The following table shows the research papers submitted at leading IIT's in India over the period of six year period use this table to answer the questions



I. I. T Delhi	I.I.T. Kanpur	I.I.T. Madras	I.I.T. Mumbai	I.I.T. Kharagpur

18. Which IIT submitted less papers in 2009?
 (A) Mumbai IIT (B) IIT Delhi (C) IIT Kanpur (D) IIT Madras
19. In what year students at IIT Delhi submitted less Papers?
 (A) 2006 (B) 2007 (C) 2008 (D) 2009
20. Which IIT submitted constant number of paper in 4 successive years?
 (A) IIT Mumbai (B) IIT Kharagpur (C) IIT Kanpur (D) IIT Madras
21. Over these 6 years of time which pair of IIT submitted majority no. of papers?
 (A) Madras & Kanpur (B) Delhi & Mumbai
 (C) Kharagpur & Madras (D) Delhi & Madras

22. Which pair of IIT's submitted less numbers of Papers over the period?
 (A) Delhi & Kharagpur (B) Mumbai & Madras
 (C) Delhi & Madras (D) Kanpur & Madras
23. In which pair of years 3 IIT's submitted same no. of Papers?
 (A) 2007 – 2009 (B) 2009 – 2010
 (C) 2010 – 2011 (D) None of these
24. Which IIT produced second highest of papers?
 (A) IIT Madras (B) IIT Delhi (C) IIT Kanpur (D) IIT Kharagpur

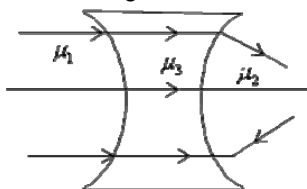
Directions (Q. 25 to 30): These questions are based on the following information. Study it carefully to answer the questions.

A and B are good in Cricket and Hockey. B and C are good in Chess and Badminton. C and D are good in Cricket, Baseball and Volleyball. E and F are good in Weightlifting.

25. Who are good in Cricket?
 (A) A, B, F (B) D, E, C (C) D, E, F (D) A, B, C
26. Who are good in Chess, Badminton, Cricket and Hockey?
 (A) A (B) B (C) E (D) F
27. Which one is playing maximum number of games?
 (A) C (B) D (C) E (D) F
28. Which one is not playing Cricket?
 (A) C (B) D (C) B (D) F
29. Which one plays Cricket as well as Hockey?
 (A) C (B) D (C) E (D) B
30. Which one is not playing Cricket?
 (A) D (B) E (C) C (D) B

PART – 2 - PHYSICS

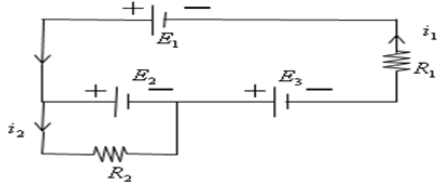
31. Critical angle of light passing from glass to water is minimum for
 (A) red colour (B) green colour (C) yellow colour (D) violet colour
32. From the figure shown establish a relation between μ_1, μ_2 and μ_3



- (A) $\mu_1 < \mu_2 < \mu_3$ (B) $\mu_3 < \mu_2; \mu_3 = \mu_1$
 (C) $\mu_3 > \mu_2; \mu_3 = \mu_1$ (D) none of these
33. A bird is flying over a swimming pool at a height of 2 m from the water surface. If the bottom is perfectly plane reflecting surface and depth of swimming pool is 1 m, then the distance of final image of bird from the bird itself is ($\mu_w = \frac{4}{3}$)
 (A) $\frac{11}{3}$ m (B) $\frac{23}{3}$ m (C) $\frac{11}{4}$ m (D) $\frac{11}{2}$ m
34. The critical angle of light going from medium A into medium B is θ . The speed of light in medium in medium A is v. The speed of light in medium B is
 (A) $\frac{v}{\sin \theta}$ (B) $v \sin \theta$ (C) $\frac{v}{\tan \theta}$ (D) $v \tan \theta$

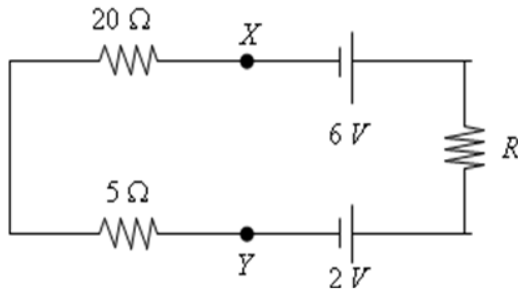
35. A convex lens of focal length 10 cm and a concave lens of focal length 15 cm are put together then this combination will act as
 (A) converging lens (B) Diverging lens
 (C) converging mirror (D) diverging mirror

36. The current i_1 and i_2 through the resistor $R_1 = 10\ \Omega$ and $R_2 = 30\ \Omega$ in the circuit diagram with $E_1 = 3V$, $E_2 = 3V$ and $E_3 = 2V$ are



- (A) 0.2 A, 0.1A (B) 0.4 A, 0.2 A (C) 0.1 A, 0.2 A (D) 0.2 A, 0.4 A

37. The potential difference between points Y and X is 2.5V. The value of resistance R is

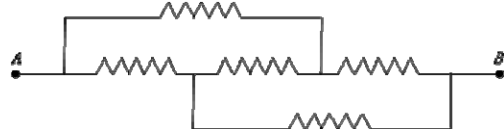


- (A) 10 ohm (B) 15 ohm (C) 20 ohm (D) 25 ohm

38. A 1 kW heater is meant to operate at 200 V. How much electrical energy will it consume in 30 days month if it operate 10 hour daily at the specified voltage?
 (A) 400 kWh (B) 300 kWh (C) 200 kWh (D) 100 kWh

39. If the length of the filament of a heater is reduced by 10% the power of the heater will
 (A) increase by about 9% (B) increase by about 11%
 (C) increase by about 19% (d) decrease by about 10%

40. All resistances in the circuit are R ohm. The equivalent resistance between A and B in ohm is

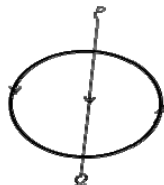


- (A) 5R (B) 4R (C) 2R (D) R

41. The magnetic field at the centre of a current carrying circular loop, in which current is anti-clockwise is
 (A) directed upwards (B) directed downwards
 (C) zero (D) proportional to the radius of the loop.

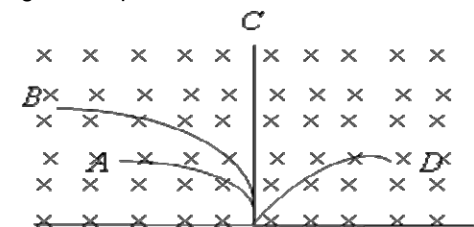
42. Two coils of same material of radius r and 2r are connected in parallel to a voltage supply V. What will be ratio of magnetic fields at the centre of the coils
 (A) 4:1 (B) 1:4 (C) 2:1 (D) 1:2

43. In the fig. PQ is a long current carrying wire which is placed near a current carrying coil. The direction of the force acting on PQ will be



- (A) Parallel to PQ, towards P. (B) Parallel to PQ, towards Q
 (C) Perpendicular to PQ towards right (D) None of these

44. The time period of a charged particle undergoing a circular motion in uniform magnetic field is independent of its
 (A) Speed (B) Mass (C) Charge (D) Magnetic induction
45. A neutron, a proton, an electron and α - particle enter a region of uniform magnetic field with same velocities. The magnetic field is perpendicular to paper and directed into the paper. The tracks of particles are labeled in fig. The α particle and neutron follows the tracks.....respectively.



- (A) A and D (B) B and D (C) A and C (D) B and C

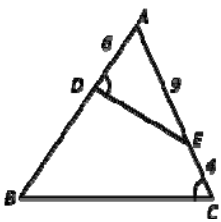
PART – 2 - CHEMISTRY

46. Lime water is
 (A) CaO (B) Ca(OH)₂ (C) CaCO₃ (D) CaCl₂
47. Which of the following is a sulphide ore -
 (A) Bauxite (B) Haematite (C) Cuprite (D) Iron pyrites
48. Froth-floatation process is used for the concentration of
 (A) oxide ore (B) sulphide ore (C) carbonate ore (D) any ore
49. Aqua regia is a mixture of
 (A) HNO₃ and HCl in the ratio 1: 3 by volume
 (B) HNO₃ and HCl in the ratio 3: 1 by volume
 (C) HNO₃ and H₂SO₄ in the ratio 1: 1 by volume
 (D) H₂SO₄ and HCl in the ratio 1: 3 by volume
50. Benzene with molecular formula, C₆H₆, has
 (A) 6 single bonds and 6 double bonds (B) 12 single bonds and 3 double bonds
 (C) 18 single bonds only (D) 12 double bonds only
51. In a reaction,
 $2\text{Ag} + 2\text{H}_2\text{SO}_4 \rightarrow \text{Ag}_2\text{SO}_4 + \text{H}_2\text{O} + \text{SO}_2$, H₂SO₄ act as :
 (A) Reducing agent (B) Oxidising agent
 (C) Dehydrating agent (D) None
52. For the redox reaction,
 $\text{MnO}_4^- + \text{C}_2\text{O}_4^{2-} + \text{H}^+ \rightarrow \text{Mn}^{+2} + \text{CO}_2 + \text{H}_2\text{O}$
 The correct coefficients of the reactants for the balanced equation are :

	MnO ₄ ⁻	C ₂ O ₄ ²⁻	H ⁺
(A)	2	5	16
(B)	16	5	2
(C)	5	16	2
(D)	2	16	5
53. Which is incorrect combination of its name and chemical formula
 (A) NaOH—sodium hydroxide (B) HNO₃ --- Nitric acid
 (C) H₃C-Cl—Chloromethyl (D) H₃N-Ammonia
54. The oxidation number of Nitrogen in HNO₃ is :
 (A) + 1 (B) + 3 (C) +5 (D) – 3
55. Among the isoelectronic species , K⁺, S²⁻, Cl⁻ and Ca²⁺ the radii of the ions decrease as :
 (A) Ca²⁺ > K⁺ > Cl⁻ > S²⁻ (B) Cl⁻ > S²⁻ > K⁺ > Ca²⁺
 (C) S²⁻ > Cl⁻ > K⁺ > Ca²⁺ (D) K⁺ > Ca²⁺ > S²⁻ > Cl⁻

56. The incorrect statement among the following is :
- (A) The first ionization potential of Al is less than the first ionization potential of Mg
 (B) The second ionization potential of Mg is greater than the second ionization potential of Na
 (C) The first ionization potential of Na is less than the first ionization potential of Mg
 (D) The third ionization potential of Mg is greater than third ionization potential of Al
57. The metallic luster exhibited by sodium is explained by:
- (A) Diffusion of sodium ions
 (B) Oscillation of mobile valence electrons
 (C) Existence of free protons
 (D) Existence of body centred cubic lattice
58. Carnelite is:
- (A) KCl (B) $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ (C) $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$ (D) $\text{KCl} \cdot \text{MgCl}_2 \cdot 6\text{H}_2\text{O}$
59. The IUPAC name of the following compound is:
- $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_3$
- (A) iso-butane (B) Butane
 (C) Propane (D) None of these
60. The correct sequence of atomic radii is
- (A) $\text{Na} > \text{Mg} > \text{Al} > \text{Si}$ (B) $\text{Al} > \text{Si} > \text{Na} > \text{Mg}$
 (C) $\text{Si} > \text{Al} > \text{Mg} > \text{Na}$ (D) $\text{Si} > \text{Al} > \text{Na} > \text{Mg}$

PART – 3 - MATHEMATICS

61. If $\sin 2\theta = 2 \sin \theta \cos \theta$ then $\sin 15^\circ + \cos 15^\circ =$
- (A) $\frac{1}{2}$ (B) $\frac{1}{\sqrt{2}}$ (C) $\frac{3}{2}$ (D) $\sqrt{\frac{3}{2}}$
62. The equation of the line passing through (1, 0) and (0, 1) is
- (A) $x + y = 1$ (B) $x = 1$ (C) $y = 1$ (D) $x + y = 2$
63. The value of $\frac{3 \sin 62^\circ}{\cos 28^\circ} - \frac{\sec 42^\circ}{\cos \text{ec} 48^\circ}$
- (A) 0 (B) 1 (C) 2 (D) 3
64. The value of BD in given fig. is
- 
- (A) 11.5 (B) 12.5 (C) 13.5 (D) 14.5
65. A ladder reaches a window 12 m above the ground and its foot is at a distance of 5 m from a wall the the length of the ladder is
- (A) 11 (B) 12 (C) 13 (D) 14
66. When 2 coins were tossed the probability that to get two heads is
- (A) $\frac{1}{4}$ (B) $\frac{1}{2}$ (C) $\frac{3}{4}$ (D) $\frac{4}{5}$
67. $\text{cosec } 30^\circ + \cot 45^\circ$ is
- (A) An integer (B) Irrational
 (C) Rational but not integer (D) Complex but not real

68. If x is any angle between 0° to 180° , how many times $\sin x = \cos x$ happens?
 (A) zero times (B) only once (C) twice (D) thrice
69. A kite is flying such that its string makes an angle of 60° with the ground if the length of the string is 100 m the height of the kite is
 (A) $25\sqrt{3}$ (B) $50\sqrt{3}$ (C) $100\sqrt{3}$ (D) $200\sqrt{3}$
70. If $\tan \theta = \frac{a}{b}$ then $\sin \theta =$
 (A) $\frac{a}{\sqrt{a^2 + b^2}}$ (B) $\frac{b}{\sqrt{a^2 + b^2}}$ (C) $\frac{ab}{\sqrt{a^2 + b^2}}$ (D) $\frac{a + b}{\sqrt{a^2 + b^2}}$

Comprehension – I (For Question no. 71 to 73):

If a, b, c are real number and $ax^2 + bx + c = 0$ is a quadratic equation $a \neq 0$. $\Delta = b^2 - 4ac$ is called Discriminant. $ax^2 + bx + c = 0$. If $\Delta > 0$, roots are real and distinct, if $\Delta = 0$ roots are real, but equal. if $\Delta < 0$ roots are complex.

71. If a, b, c are real and distinct then $(a - b)x^2 + (b - c)x + (c - a) = 0$ has roots such that
 (A) One root is integer the other is $\frac{c - a}{a - b}$ (B) One root is irrational the other is $\frac{c - a}{a - b}$
 (C) One root is integer the other is $\frac{a - b}{c - a}$ (D) One root is irrational the other is $\frac{a - b}{c - a}$
72. The roots of $x^2 + x - 1 = 0$ are
 (A) Complex (B) Irrationals conjugate to each other
 (C) Rationals (D) Integers
73. The sum of the roots of $\sqrt{2}x^2 - x + 1 = 0$ is
 (A) $\frac{1}{\sqrt{2}}$ (B) $-\frac{1}{\sqrt{2}}$ (C) 0 (D) 1

Comprehension – II (For Question no. 74 to 76):

Sequence of the form $a, a + d, a + 2d, \dots \dots a + (n - 1)d$ is called an A.P.

74. The n th term of the A.P. 0, 2, 4, 6
 (A) $2n$ (B) $2(n + 1)$ (C) $2(n - 1)$ (D) None
75. The sum of integers from 6 to 60 is
 (A) Divisible by 121 (B) Divisible by 7
 (C) Divisible by 13 (D) Divisible by 2
76. For an A.P. whose sum of first n terms $S_n = n^2 + n$ then 6th terms of A.P. is
 (A) 12 (B) 11 (C) 10 (D) 9
77. Two dice are rolled the probability that the sum of the numbers on them is perfect squares is
 (A) $\frac{7}{36}$ (B) $\frac{1}{6}$ (C) $\frac{5}{6}$ (D) $\frac{5}{36}$
78. Two digit numbers is formed out of 0, 1, 2, 3, 4 where digits are not repeated. The probability that the number formed is an even number is
 (A) $\frac{5}{8}$ (B) $\frac{1}{8}$ (C) $\frac{3}{8}$ (D) $\frac{7}{8}$
79. A sphere is inscribed in a cube such that sphere touches all the faces of a cube. Then the ratio of volume of cube to that of sphere is
 (A) $6 : \pi$ (B) $\pi : 6$ (C) $5 : \pi$ (D) $\pi : 5$
80. A solid metallic sphere of radius 30 cm is melted to make solid cylinders of radius 10 cm and height 6 cm each . How many such cylinders can be made ?
 (A) 60 (B) 100 (C) 120 (D) 200

81. A triangle is inscribed in a circle of radius 1. Then maximum side length of the triangle is
 (A) 1 (B) 2 (C) 4 (D) 6
82. The distance between A(1, 1), B(2, 2) is
 (A) 1 (B) 2 (C) $\sqrt{3}$ (D) $\sqrt{2}$
83. The midpoint of line joining A(-1, 0), B(1, 0) lies on
 (A) x axis (B) 1st quadrant
 (C) II quadrant (D) none
84. A parallelogram inscribed in a circle is
 (A) Always rectangle (B) Always a square
 (C) Always a rhombus (D) None
85. Maximum value of $1 + \sin^2 x$ is
 (A) 1 (B) 0 (C) 2 (D) None
86. The value of $\cos 1^\circ \cdot \cos 2^\circ \cdot \cos 3^\circ \dots \dots \cos 90^\circ =$
 (A) 1 (B) 0 (C) $1/32$ (D) None
87. The value of $\cos^2 \theta + \frac{1}{1 + \cot^2 \theta} =$
 (A) 1 (B) $\sqrt{2}$ (C) 0 (D) $\sqrt{3}$
88. If $\sec \theta = x + \frac{1}{4x}$ then $\sec \theta + \tan \theta =$
 (A) $2x$ (B) $1/x$ (C) $2/x$ (D) x
89. The value of $(2 \cos^2 \theta - 1)(1 + \tan^2 \theta) =$
 (A) 1 (B) 0 (C) -1 (D) None
90. The value of $2 \tan 50^\circ + \tan 20^\circ =$
 (A) $\tan 70^\circ$ (B) $\tan 55^\circ$ (C) $\tan 50^\circ$ (D) $\tan 75^\circ$

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MAHARASHTRA SCIENCE TALENT SEARCH EXAMINATION

for students of Class X
Answers

PART – 1 - I.Q

- | | | | |
|------|-------|-------|-------|
| 1. B | 9. A | 17. B | 25. D |
| 2. B | 10. A | 18. A | 26. B |
| 3. C | 11. C | 19. A | 27. A |
| 4. D | 12. D | 20. A | 28. D |
| 5. B | 13. D | 21. A | 29. D |
| 6. D | 14. C | 22. A | 30. B |
| 7. D | 15. B | 23. A | |
| 8. B | 16. A | 24. A | |

PART – 2 - PHYSICS

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|-------|-------|-------|-------|
| 31. D | 35. A | 39. B | 43. D |
| 32. B | 36. A | 40. D | 44. A |
| 33. D | 37. B | 41. A | 45. D |
| 34. A | 38. B | 42. B | |

PART – 2 - CHEMISTRY

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|-------|-------|-------|-------|
| 46. B | 50. B | 54. C | 58. D |
| 47. D | 51. B | 55. C | 59. B |
| 48. B | 52. A | 56. B | 60. A |
| 49. A | 53. C | 57. B | |

PART – 3 - MATHEMATICS

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|-------|-------|-------|-------|
| 61. D | 69. B | 77. A | 85. C |
| 62. A | 70. A | 78. A | 86. B |
| 63. C | 71. A | 79. A | 87. A |
| 64. C | 72. B | 80. A | 88. A |
| 65. C | 73. A | 81. B | 89. D |
| 66. A | 74. C | 82. D | 90. A |
| 67. A | 75. A | 83. A | |
| 68. B | 76. A | 84. A | |