



**MENTORS EDUSERV SCHOLASTIC APTITUDE TEST (ME-SAT)  
SAMPLE TEST PAPER**  
[For Students presently in Class 10 going to Class 11 in 2019]  
(Stream: Engineering)

**Time : 2 hours**

**Maximum Marks: 240**

**INSTRUCTIONS**

DONOT BREAK THE SEALS ON THIS BOOKLET, AWAIT INSTRUCTIONS FROM THE INVIGILATOR.

**[A] General**

1. This Question paper contains **FOUR** Parts, **A to D** (Physics, Chemistry, Mathematics and Mental Ability).
2. This Question Paper contains **15 pages**.
3. This question paper contains total **80 questions** (20 questions each in Physics, Chemistry, Mathematics and Mental Ability).
4. The Question Paper has blank spaces at the bottom of each page for rough work. No additional sheets will be provided for rough work.
5. Blank papers, clip boards, log tables, slide rule, calculators, cellular phones, pagers and electronic gadgets, in any form, are **NOT** allowed.
6. The **OMR** (Optical Mark Recognition) sheet shall be provided separately.

**[B] Answering on the OMR**

7. In all the parts, each question will have **4 choices** out of which **only one choice is correct**.
8. Darken the bubble with **Ball Pen (Blue or Black) ONLY**.

**[C] Filling OMR**

9. On the **OMR sheet**, fill all the details properly and completely, otherwise your OMR will not be checked.
10. Do not write anything or tamper the barcode in the registration no. box.

**[D] Marking Scheme:**

11. For each question you will be awarded **3 marks** if you darken the bubble corresponding to the correct answer **ONLY** and **zero (0) marks** if no bubble is darkened. In all other cases, **minus one (-1) mark** will be awarded.

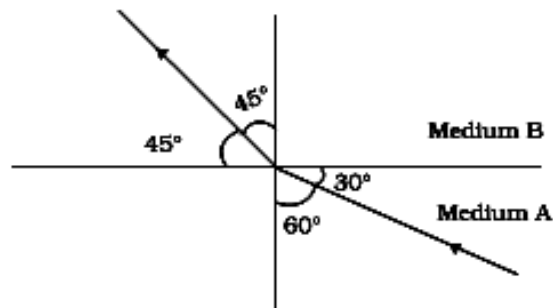
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Registration No.:

**SEAL**

**PART-A : PHYSICS**

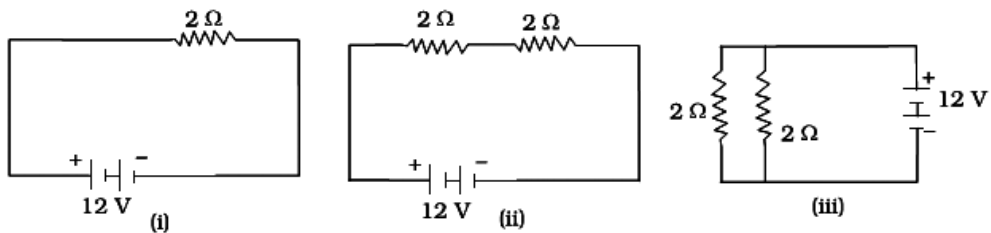
- Where should an object be placed in front of a convex lens to get a real image of the size of the object?
  - At the principal focus of the lens
  - At twice the focal length
  - At infinity
  - Between the optical centre of the lens and its principal focus.
- Figure below shows a ray of light as it travels from medium A to medium B. Refractive index of the medium B relative to medium A is



- (A)  $\sqrt{3}/\sqrt{2}$       (B)  $\sqrt{2}/\sqrt{3}$       (C)  $1/\sqrt{2}$       (D)  $\sqrt{2}$
- A child is standing in front of a magic mirror. She finds the image of her head bigger, the middle portion of her body of the same size and that of the legs smaller. The following is the order of combinations for the magic mirror from the top.
    - Plane, convex and concave
    - Convex, concave and plane
    - Concave, plane and convex
    - Convex, plane and concave

Space for rough work

4. At noon the sun appears white as
- (A) light is least scattered
  - (B) all the colours of the white light are scattered away
  - (C) blue colour is scattered the most
  - (D) red colour is scattered the most
5. In the following circuits (Figure), heat produced in the resistor or combination of resistors connected to a 12 V battery will be



- (A) same in all the cases
  - (B) minimum in case (i)
  - (C) maximum in case (ii)
  - (D) maximum in case (iii)
6. In an electrical circuit three incandescent bulbs A, B and C of rating 40 W, 60 W and 100 W respectively are connected in parallel to an electric source. Which of the following is likely to happen regarding their brightness?
- (A) Brightness of all the bulbs will be the same
  - (B) Brightness of bulb A will be the maximum
  - (C) Brightness of bulb B will be more than that of A
  - (D) Brightness of bulb C will be less than that of B

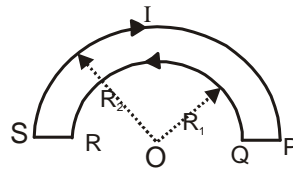
Space for rough work

7. For a current in a long straight solenoid N- and S-poles are created at the two ends. Among the following statements, the incorrect statement is
- (A) The field lines inside the solenoid are in the form of straight lines which indicates that the magnetic field is the same at all points inside the solenoid.
  - (B) The strong magnetic field produced inside the solenoid can be used to magnetise a piece of magnetic material like soft iron, when placed inside the coil.
  - (C) The pattern of the magnetic field associated with the solenoid is different from the pattern of the magnetic field around a bar magnet.
  - (D) The N- and S-poles exchange position when the direction of current through the solenoid is reversed.
8. A piece of wire of resistance  $R$  is cut into five equal parts. These parts are then connected in parallel. If the equivalent resistance of this combination is  $R'$ , then the ratio  $R / R'$  is
- (A)  $1/25$                       (B)  $1/5$                       (C)  $5$                       (D)  $25$
9. The phenomenon of electromagnetic induction is
- (A) the process of charging a body.
  - (B) the process of generating magnetic field due to a 'current passing through a coil.
  - (C) producing induced current in a coil due to relative motion between a magnet and the coil.
  - (D) the process of rotating a coil of an electric motor.
10. At the time of short circuit, the current in the circuit
- (A) reduces substantially                      (B) does not change  
(C) increases heavily.                      (D) vary continuously
11. The combination responsible for admitting different amounts of light into the eye is
- (A) ciliary muscles and crystalline lens      (B) ciliary muscles and pupil  
(C) iris and pupil                      (D) rods and cones

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Space for rough work

12. Consider the following statements:
- A. In series connection, the same current flows through each element.  
 B. In parallel connection, the same potential difference gets applied across each element.
- (A) both A and B are correct                      (B) A is correct but B is wrong  
 (C) A is wrong but B is correct                      (D) both A and B are wrong
13. A commutator changes the direction of current in the coil of
- (A) a DC motor                      (B) a DC motor and an AC generator  
 (C) a DC motor and a DC generator                      (D) an AC generator
14. A wire of resistance 10.0 ohm is stretched so as to increase its length by 20%. Its resistance then would be
- (A) 10.0 ohm                      (B) 20.0 ohm                      (C) 14.4 ohm                      (D) 10.2 ohm
15. The masses of three wires of copper are in the ratio 1 : 3 : 5 and their lengths are in the ratio 5 : 3 : 1. The ratio of their electrical resistances is
- (A) 1 : 3 : 5                      (B) 5 : 3 : 1  
 (C) 1 : 15 : 125                      (D) 125 : 15 : 1
16. The wire loop PQRSP formed by joining two semicircular wires of radii  $R_1$  and  $R_2$  carries a current  $I$  as shown in the figure. The magnitude of the magnetic induction at the centre 'O' is



- (A)  $\frac{\mu_0 I}{2} \left[ \frac{1}{R_1} - \frac{1}{R_2} \right]$       (B)  $\frac{\mu_0 I}{4} \left[ \frac{1}{R_1} - \frac{1}{R_2} \right]$       (C)  $\frac{\mu_0 I}{4} \left[ \frac{1}{R_2} - \frac{1}{R_1} \right]$       (D)  $\frac{\mu_0 I}{2} \left[ \frac{1}{R_2} - \frac{1}{R_1} \right]$

Space for rough work

17. The critical angle of a light going from medium A into medium B is  $\theta$ . The speed of light 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)  $V \tan \theta$
18. An instrument based on the principle of Total internal reflection of the light is:
- (A) Optical Fiber              (B) Galvanometer              (C) Telescope              (D) Microscope
19. The force on a charged particle 'q' which is kept at rest in a uniform magnetic field 'B' is
- (A) zero                      (B)  $qvB$                       (C)  $qvB \sin \theta$                       (D)  $qvB \cos \theta$
20. An AC generator is connected to an electric appliance. In 10 revolutions of the armature, the current in the appliance changes direction
- (A) 5 times                      (B) 10 times                      (C) 20 times                      (D) 40 times

## PART-B : CHEMISTRY

21. In the following equations :
- $\text{Na}_2\text{CO}_3 + x\text{HCl} \rightarrow 2\text{NaCl} + \text{CO}_2 + \text{H}_2\text{O}$ , the value of  $x$  is
- (A) 1                      (B) 2                      (C) 3                      (D) 4
22. Combination of phosphorus and oxygen is an example of
- (A) oxidation              (B) reduction              (C) rancidity              (D) none of these
23. Which of the following statements is not true for the chemical equation ?
- $2\text{N}_2\text{O}_5 \rightarrow 4\text{NO}_2 + \text{O}_2$
- (A) 2 mol of  $\text{N}_2\text{O}_5$  on dissociation gives 4 mol of  $\text{NO}_2$  and 1 mol of  $\text{O}_2$ .
- (B) 1 mol of  $\text{N}_2\text{O}_5$  on dissociation gives 2 mol of  $\text{NO}_2$  and 0.5 mol of  $\text{O}_2$ .
- (C) 2 g of  $\text{N}_2\text{O}_5$  on dissociation gives 4g of  $\text{NO}_2$  and 1 g of  $\text{O}_2$ .
- (D) 216 g of  $\text{N}_2\text{O}_5$  on dissociation gives 184 g of  $\text{NO}_2$  and 32 g mol of  $\text{O}_2$ .

Space for rough work

24. The species among the following, which can act as an acid and a base is  
(A)  $\text{HSO}_4^-$  (B)  $\text{SO}_4^{2-}$  (C)  $\text{H}_3\text{O}^+$  (D)  $\text{Cl}^-$
25. Which of the following does not give  $\text{H}^+$  ions in aqueous solution?  
(A)  $\text{H}_2\text{CO}_3$  (B)  $\text{C}_2\text{H}_5\text{OH}$  (C)  $\text{CH}_3\text{COOH}$  (D)  $\text{H}_3\text{PO}_4$
26. pH is a measure of .....ions in a solution.  
(A) hydrogen (B) hydroxide (C) ammonium (D) carbonium
27. Which of the following is an oxide ore?  
(A) Bauxite (B) Cuprite (C) Haematite (D) All of these
28. Zone refining process is used for the  
(A) concentration of an ore (B) reduction of a metal oxide  
(C) purification of metal (D) purification of an ore
29. Metal always found in free state is  
(A) gold (B) silver (C) copper (D) sodium
30. The process of heating an ore in limited air and below its melting point is called  
(A) smelting (B) roasting (C) calcination (D) pyrolysis
31. Which is true about electronegativity order?  
(A)  $\text{P} > \text{Si}$  (B)  $\text{C} > \text{N}$  (C)  $\text{Br} > \text{Cl}$  (D)  $\text{Sr} > \text{Ca}$
32. The correct order of electron affinity among the following is  
(A)  $\text{F} > \text{Cl} > \text{Br}$  (B)  $\text{Br} > \text{Cl} > \text{F}$  (C)  $\text{Cl} > \text{F} > \text{Br}$  (D)  $\text{F} > \text{Br} > \text{Cl}$
33. The most basic oxide is  
(A)  $\text{Na}_2\text{O}$  (B)  $\text{Al}_2\text{O}_3$  (C)  $\text{SO}_2$  (D)  $\text{NO}_2$
34. Which of the following oxides is amphoteric in nature?  
(A)  $\text{CaO}$  (B)  $\text{CO}_2$  (C)  $\text{SiO}_2$  (D)  $\text{SnO}_2$

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Space for rough work

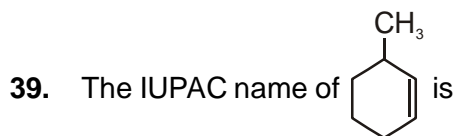
35. All the members in a group of a long form of periodic table have the same
- (A) valency (B) number of valence electrons  
(C) chemical properties (D) all of the above

36. Aliphatic compounds essentially contain
- (A) an aromatic ring  
(B) a non-aromatic ring  
(C) a ring containing an atom other than carbon  
(D) no ring at all

37. 2-methyl but-2-ene will be represented as



38. Which of the following is not a saturated hydrocarbon?
- (A) Hexanol (B) Benzene  
(C) Butane (D) Isobutane



- (A) 3 - methyl cyclohexene (B) 1- methyl cyclohex-2-ene  
(C) 6-methyl cyclohexene (D) 1-methyl cyclohex-5-ene

Space for rough work



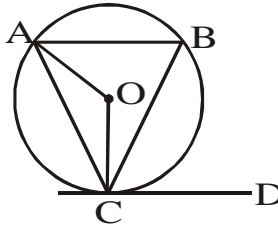
40. Methane, ethane and propane are said to form a homologous series because all are –
- (A) hydrocarbons
  - (B) saturated hydrocarbons
  - (C) aliphatic hydrocarbons
  - (D) differ from each other by  $-\text{CH}_2$  group

### PART-C : MATHEMATICS

41. If  $a + b + c = 0$ , then  $\frac{a^5 + b^5 + c^5}{ab + bc + ca}$  equals
- (A)  $abc$
  - (B)  $-5abc$
  - (C)  $-abc$
  - (D)  $-1$
42. If  $5^{x-1} = 10^x \cdot 2^{-x} \cdot 5^{x+1}$ , then  $x$  is equal to
- (A)  $-2$
  - (B)  $2$
  - (C)  $1/2$
  - (D)  $-1/2$
43. When  $x^{200} + 1$  is divided by  $x^2 + 1$ , the remainder is equal to
- (A)  $x + 2$
  - (B)  $2x - 1$
  - (C)  $2$
  - (D)  $-1$
44. A man from the top of a 100 m high tower see a car moving towards the tower at an angle of depression of  $30^\circ$ . After some time, the angle of depression becomes  $60^\circ$ . the distance (in metres) traveled by the car during this time is
- (A)  $100\sqrt{3}$
  - (B)  $\frac{200\sqrt{3}}{3}$
  - (C)  $\frac{100\sqrt{3}}{3}$
  - (D)  $200\sqrt{3}$
45. The expression  $\frac{\tan A}{1 - \cot A} + \frac{\cot A}{1 - \tan A}$  can be written as
- (A)  $\sin A \cos A + 1$
  - (B)  $\sec A \operatorname{cosec} A + 1$
  - (C)  $\tan A + \cot A$
  - (D) None of these

Space for rough work

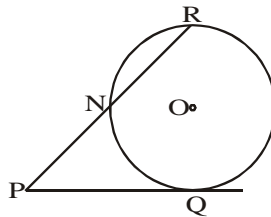
46. What are the HCF and LCM of 124 and 224?  
 (A) 14 and 1984 (B) 4 and 6944 (C) 8 and 3472 (D) 2 and 13888
47. If  $2^{2x-1} + 2^{1-2x} = 2$ , then the value of  $x$  is  
 (A) 0.5 (B) -0.5 (C) 1 (D) 0
48. If one root is  $3 + \sqrt{5}$ , then quadratic equation will be :  
 (A)  $x^2 + 6x - 4 = 0$  (B)  $x^2 + 6x + 4 = 0$  (C)  $x^2 - 6x + 4 = 0$  (D)  $x^2 - 6x - 4 = 0$
49. If  $x \sin^3 \theta + y \cos^3 \theta = \sin \theta \cos \theta$  and  $x \sin \theta = y \cos \theta$  then :  
 (A)  $x^3 + y^3 = 1$  (B)  $x^2 - y^2 = 1$  (C)  $x^2 + y^2 = 1$  (D)  $x^3 - y^3 = 1$
50. ABC is a triangle and DE is drawn parallel to BC cutting the other sides at D and E. If  $AB = 3.6$  cm,  $AC = 2.4$  cm and  $AD = 2.1$  cm, then AE is equal to :  
 (A) 1.4 cm (B) 1.8 cm (C) 1.2 cm (D) 1.05 cm
51. The line segments joining the mid points of the sides of a triangle form four triangles each of which is :  
 (A) similar to the original triangle. (B) congruent to the original triangle.  
 (C) an equilateral triangle. (D) an isosceles triangle.
52. In the given diagram O is the centre of the circle and CD is a tangent.  $\angle CAB$  and  $\angle ACD$  are supplementary to each other  $\angle OAC = 30^\circ$ . Find the value of  $\angle OCB$  :



- (A)  $30^\circ$  (B)  $20^\circ$  (C)  $60^\circ$  (D)  $45^\circ$

Space for rough work

53. The remainder when  $x^{2011}$  is divided by  $x^2 - 3x + 2$  is  
 (A) 2011 (B)  $2011x - 2010$   
 (C)  $(2^{2011} - 2)x + (2 - 2^{2011})$  (D)  $(2^{2011} - 1)x + (2 - 2^{2011})$
54. In the given figure, PQ is the tangent of the circle. Line segment PR intersects the circle at N and R. PQ = 15 cm, PR = 25 cm then PN equals

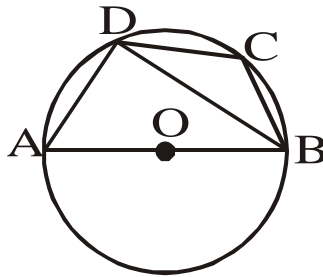


- (A) 15 cm (B) 10 cm (C) 9 cm (D) 6 cm
55. If  $a_1, a_2, \dots, a_n$  are  $n$  A.M.'s between  $a$  and  $b$ , then  $2 \sum_{i=1}^n a_i$  equals  
 (A)  $ab$  (B)  $n(a + b)$  (C)  $\frac{n(a+b)}{ab}$  (D)  $\frac{a+b}{n}$
56. If  $\frac{3 + 5 + 7 + \dots \text{upto } n \text{ terms}}{5 + 8 + 11 + \dots \text{upto } 10 \text{ terms}} = 7$ , then the value of  $n$  is :  
 (A) 35 (B) 36 (C) 37 (D) 40
57. If median is equal to 4 and mode is equal to 6, then mean is  
 (A) 2 (B) 3 (C) 4 (D) 5
58. If in the triangles ABC and DEF, angle A is equal to angle E, both are equal to  $40^\circ$ ,  $AB : ED = AC : EF$  and angle F is  $65^\circ$ , then angle B is  
 (A)  $35^\circ$  (B)  $65^\circ$  (C)  $75^\circ$  (D)  $85^\circ$

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Space for rough work

59. In the adjoining figure AB is a diameter of the circle and  $\angle BCD = 130^\circ$  then the value of  $\angle ABD$  is



- (A)  $30^\circ$                       (B)  $50^\circ$                       (C)  $40^\circ$                       (D)  $20^\circ$
60.  $\frac{1}{1 \times 2} + \frac{1}{2 \times 3} + \frac{1}{3 \times 4} + \dots + \frac{1}{n(n+1)}$  equals :
- (A)  $\frac{n+1}{n}$                       (B)  $\frac{n(n+1)}{6}$                       (C)  $\frac{n}{n+1}$                       (D)  $\frac{n^2}{n+1}$

### PART-D : MENTAL ABILITY

61. If Development is written as Tnemdevelop, then Evaluation will be written as
- (A) Notiaevalu                      (B) Noitaulave                      (C) Notievalua                      (D) Noitevalua

**DIRECTIONS (Q. Nos. 62-63) :** From the given alternative words, select the word which cannot be formed using the letters of the given word.

62. **UNCONTAMINATED**

- (A) MINE                      (B) NATON                      (C) CONNOTE                      (D) TANDEM

63. **DEPARTMENT**

- (A) ENTER                      (B) PARENT                      (C) TEMPER                      (D) PARADE

Space for rough work

64. If '+' means 'x', '-' means '÷', '÷' means '+' and 'x' means '-', then what will be the value of  $16 \div 64 - 4 \times 4 + 3 = ?$

- (A) 20                      (B) 52                      (C) 15                      (D) 12

**DIRECTIONS (Q. No. 65) :** Select the missing number from the given responses.

65.

6	5	4
7	6	5
5	7	6
37	23	?

- (A) 14                      (B) 10                      (C) 12                      (D) 13

**DIRECTIONS (Q. Nos. 66-67) :** Find the odd number/letters/ number pair from the given alternatives.

66. (A) AZBY                      (B) CXDW                      (C) EVFU                      (D) TGSH  
 67. (A) 12 – 144                      (B) 13 – 156                      (C) 15 – 180                      (D) 16 – 176

**DIRECTIONS : (68)** Select the missing number from the given responses.

68.

6	8	7
36	64	49
24	48	35
18	24	?

- (A) 17                      (B) 18                      (C) 19                      (D) 21

**DIRECTIONS (Q. No. 69) :** Find out the wrong number in the series.

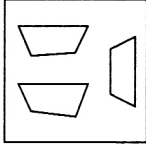
69. 27, 81, 1331, 125  
 (A) 125                      (B) 27                      (C) 1331                      (D) 81

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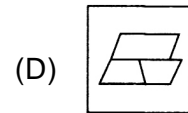
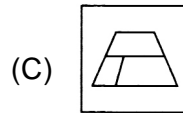
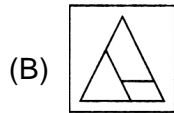
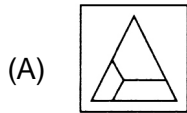
Space for rough work

**DIRECTIONS :** In which among the answer figures can be constructed from the parts given in question figure?

**70. Question Figure**



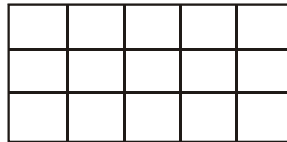
**Answer figure**



**71.** Ravi travelled 4 km straight towards South. He turned left and travelled 6 km straight, then turned right and travelled 4 km straight. How far is he from the starting point?

- (A) 8 km                      (B) 10 km                      (C) 12 km                      (D) 18 km

**72.** How many squares are there in the following figure ?



- (A) 24                      (B) 25                      (C) 26                      (D) 27

**73.**

4	$\frac{1}{5}$	$\frac{21}{5}$
1	$\frac{1}{2}$	$\frac{3}{2}$
2	?	$\frac{8}{3}$

- (A)  $\frac{5}{4}$                       (B)  $\frac{3}{4}$                       (C)  $\frac{2}{3}$                       (D)  $\frac{1}{2}$

Space for rough work

74. 
$$\begin{array}{c} 25 \\ 64 \boxed{31} 144 \\ 36 \end{array} \quad \begin{array}{c} 324 \\ 9 \boxed{38} 16 \\ 169 \end{array} \quad \begin{array}{c} 64 \\ 36 \boxed{?} 576 \\ 361 \end{array}$$

- (A) 115                      (B) 82                      (C) 135                      (D) 57

75. A student got twice as many sums wrong as he got right. If he attempted 48 sums in all, how many did he solve correctly ?

- (A) 12                      (B) 16                      (C) 24                      (D) 18

76. In an examination, a student scores 4 marks for every correct answer and loses 1 mark for every wrong answer. If he attempts all 75 questions and secures 125 marks, the total number of questions he attempted correctly, is :

- (A) 35                      (B) 40                      (C) 42                      (D) 46

**DIRECTIONS (77) :** A cube is painted red on two adjacent surfaces and black on the surfaces opposite to red surfaces and green on the remaining faces. Now the cube is cut into sixty four smaller cubes of equal size.

77. How many smaller cubes will have no surface painted ?

- (A) 0                      (B) 4                      (C) 8                      (D) 16

**DIRECTIONS (78–79) :** Correct the following equations by interchanging the two signs :

78.  $3 - 9 \times 27 + 9 \div 3 = 3$

- (A) + and -                      (B) x and +                      (C) x and  $\div$                       (D) x and -

79.  $5 \times 15 \div 7 - 20 + 4 = 77$

- (A) - and +                      (B) x and  $\div$                       (C) + and  $\div$                       (D) + and x

**DIRECTIONS (80) :** Correct the following equations by interchanging the two signs :

80.  $4 \times 2 + 6 \div 2 - 12 = 2$

- (A)  $\div$  and x                      (B) + and -                      (C) x and +                      (D)  $\div$  and -

Space for rough work

## ANSWER - KEY

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### PART- A : PHYSICS

- |         |         |         |         |         |
|---------|---------|---------|---------|---------|
| 1. (B)  | 2. (A)  | 3. (C)  | 4. (A)  | 5. (D)  |
| 6. (C)  | 7. (C)  | 8. (D)  | 9. (C)  | 10. (C) |
| 11. (C) | 12. (A) | 13. (A) | 14. (C) | 15. (D) |
| 16. (B) | 17. (A) | 18. (A) | 19. (A) | 20. (C) |

### PART- B : CHEMISTRY

- |         |         |         |         |         |
|---------|---------|---------|---------|---------|
| 21. (D) | 22. (A) | 23. (C) | 24. (A) | 25. (B) |
| 26. (A) | 27. (D) | 28. (C) | 29. (A) | 30. (C) |
| 31. (A) | 32. (C) | 33. (A) | 34. (D) | 35. (D) |
| 36. (D) | 37. (B) | 38. (B) | 39. (A) | 40. (D) |

### PART- C : MATHEMATICS

- |         |         |         |         |         |
|---------|---------|---------|---------|---------|
| 41. (B) | 42. (A) | 43. (C) | 44. (B) | 45. (B) |
| 46. (B) | 47. (A) | 48. (C) | 49. (C) | 50. (A) |
| 51. (A) | 52. (A) | 53. (D) | 54. (C) | 55. (B) |
| 56. (A) | 57. (B) | 58. (C) | 59. (C) | 60. (C) |

### PART- D : MENTAL ABILITY

- |         |         |         |         |         |
|---------|---------|---------|---------|---------|
| 61. (D) | 62. (C) | 63. (D) | 64. (A) | 65. (A) |
| 66. (D) | 67. (D) | 68. (D) | 69. (D) | 70. (A) |
| 71. (B) | 72. (C) | 73. (C) | 74. (D) | 75. (B) |
| 76. (B) | 77. (C) | 78. (D) | 79. (C) | 80. (A) |