Spectrum
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SPECTRUM SCHOLARSHIP cum ENTRANCE TEST

SAMPLE PAPER

NAME : _____ **Reg. No. :** _____

Class: **X**
Time: **2 Hours**
Max. Marks: **225**

INSTRUCTIONS

1. The question paper contains **75** questions in four parts (Part A : Chemistry , Part B : Physics, Part C : Mathematics and Part D : Mental Ability) and **20** pages.

Part A contains 15 questions, Part B contains 15 questions, Part C contains 30 questions, Part D contains 15 questions.

Each question has four options A, B, C & D, out of which **only one option is correct.**

Each question carries **+3 marks** for correct answer and **-1 mark** for wrong answer.

Please ensure that the Question Paper you have received contains all the QUESTIONS and Pages. If you found some mistake like missing questions or pages then contact immediately to the Invigilator.

2. Indicate the correct answer(s) for each question by filling appropriate bubble(s) in your OMR sheet.

3. Use onlyBlue/Black.Pen for darkening the bubble(s).

4. Use of Calculator, Log Table, Slide Rule and Mobile is not allowed.

5. For example if only '**B**' choice is correct then, the correct method for filling the bubble is

A	B	C	D
○	●	○	○

The answer of the question in any other manner (such as putting ✓, cross ✗, or partial shading ◔ etc.) will be treated as wrong.

PART A: CHEMISTRY

Q.1 to Q.15 has four choices (A), (B), (C), (D) out of which only **ONE** is correct.

1. Rutherford's alpha-particle scattering experiment was responsible for the discovery of
(A) Atomic Nucleus (B) Electron (C) Proton (D) Neutron

2. Which of the following traids represents isotones (same no of neutrons)?
(A) ${}_6C^{12}, {}_6C^{13}, {}_6C^{14}$ (B) ${}_{18}Ar^{40}, {}_{20}Ca^{42}, {}_{21}Sc^{43}$
(C) ${}_{18}Ar^{40}, {}_{20}Ca^{40}, {}_{21}Sc^{41}$ (D) ${}_7N^{14}, {}_8O^{16}, {}_9F^{19}$

3. Which of the following statement is incorrect?
(A) In oxidation, oxygen in added to a substance
(B) In reduction, Hydrogen is added to a substance
(C) Oxidizing agent in oxidized
(D) Reducing agent is oxidized

4. An element X belongs to group 14 and 2nd period of the periodic table. Its atomic number will be
(A) 6 (B) 14 (C) 7 (D) 15

5. When ferrous sulphate is heated the following reaction takes place:
$2FeSO_4(s) \rightarrow Fe_2O_3(s) + SO_2(g) + SO_3(g)$
(A) Thermal Displacement (B) Combination
(C) Thermal Decomposition (D) Double displacement

SPACE FOR ROUGH WORK

6. Which of the following does not displace hydrogen from acids ?
(A) Copper (B) Sodium (C) Magnesium (D) Zinc

7. What are the formulae for ethane, propane and hexane respectively?

(A) C_2H_4, C_3H_6 and C_6H_{14} (B) C_3H_6, C_5H_{10} and C_6H_{14}

(C) C_2H_6, C_3H_8 and C_6H_{16} (D) C_2H_6, C_3H_8 and C_6H_{14}

8. How many atoms are present in a mole of H_2SO_4 ?
(A) $3 \times 6.02 \times 10^{23}$ (B) $5 \times 6.02 \times 10^{23}$
(C) $6 \times 6.02 \times 10^{23}$ (D) $7 \times 6.02 \times 10^{23}$

9. Which of the following propertie is not correct about organic compounds :
(A) They are generally covalent compounds
(B) They have high melting and boiling points
(C) They are generally insoluble in water
(D) Produce CO_2 on combusation.

10. A solution of $CuSO_4$ was kept in a iron pot. After few days, the iron pot was found to have a number of holes in it. This can be explained by
(A) Cu metal is more reactive than iron and it can displace iron
(B) In presence of $CuSO_4$ iron get rusted.
(C) Fe metal is more reactive than Cu and it can displace Cu from $CuSO_4$
(D) Fe reacts with $CuSO_4$ and forms copper pyrites.

SPACE FOR ROUGH WORK

11. Which of the following metals is not a coinage metal ?
(A) Silver (B) Gold (C) Copper (D) Sodium

12. Calculate the mass of 0.6 mole of NH_3 (Atomic mass of N:14, H:1)
(A) 20.4 gm (B) 10.2 gm (C) 17 gm (D) 8.59 gm

13. Graphite is used as a lubricant because it is
(A) greyish black (B) insoluble in water
(C) having high melting point (D) soft, sllipery

14. Name the process by which a drop of ink spreads in a beaker of water –
(A) Diffusion (B) Vaporization (C) Condensation (D) Sublimation

15. A saturated hydrocarbon has 50 hydrogen atom. The number of carbon atom in the hydrocarbon will be:
(A) 24 (B) 26 (C) 25 (D) 23

SPACE FOR ROUGH WORK

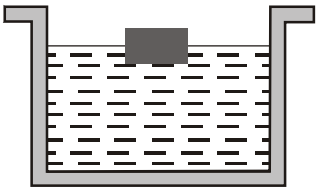
PART B: PHYSICS

Q.16 to Q.30 has four choices (A), (B), (C), (D) out of which only **ONE** is correct.

16. An object starts with velocity 5 m/s and after time 10s it has the velocity of 9m/s. Then the displacement is given by

(A) 70 m (B) 90 m (C) 20 m (D) 0 m

17. A body floats in a liquid contained in a beaker. The whole system now falls freely under gravity. The upthrust on the body is (see fig.),



(A) Zero

(B) Equal to the weight of liquid displaced

(C) Equal to the weight of the body in air

(D) Equal to the weight of the immersed portion of body

18. Size of object is same as image. Which of the following is possible:

(A) Convex Mirror, Object at Focus

(B) Convex Mirror, Object at Center of Curvature

(C) Concave Mirror, Object at Focus

(D) Concave Mirror, Object at Center of Curvature

19. Which of the following is formula for power loss in resistance?

(A) IR^2 (B) $\frac{V}{R^2}$ (C) V^2R (D) VI

SPACE FOR ROUGH WORK

20. Two particles are placed at some distance. If the mass of each of the two particles is doubled, keeping the distance between them unchanged, the value of gravitational force between them will be

(A) $\frac{1}{4}$ times (B) 4 times (C) $\frac{1}{2}$ times (D) unchanged

21. If the index finger points towards the north and the middle finger towards the east, by using Fleming's left hand rule what will be the direction of motion or the force acting on the conductor ?

(A) South (B) West (C) Top (D) Bottom

22. Lungs perform 2.4 J of work during each expansion. How many times do they expand per minute if their power is 2 Watts?

(A) 50 times (B) 40 times (C) 60 times (D) 30 times

23. If 30 electrons are travelling in conductor for 5 seconds. Then the current is:

(A) 9.6×10^{-19} A (B) 9.6×10^{-16} A (C) 4.8×10^{-16} A (D) 1.6×10^{-19}A

24. At what temperature Celsius and Fahrenheit scales give the same reading.

(A) – 32° (B) – 40° (C) 32° (D) 40°

25. If some amount of water is heated from 0°C to 10°C. Then its

(A) density first increases and then decreases.

(B) density first decreases and then increases.

(C) volume first increases and then decreases.

(D) volume continuously increases

SPACE FOR ROUGH WORK

26. Magnetic field produced at the centre of a current carrying circular wire is :

(A) Directly proportional to the square of the radius of the circular wire

(B) Directly proportional to the radius of the circular wire

(C) Inversely proportional to the square of the radius of the circular wire

(D) Inversely proportional to the radius of the circular wire.

27. When light enters a denser medium:

(A) It bends towards Normal (B) It bends away from Normal

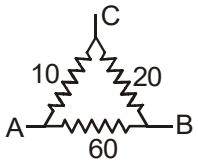
(C) It does not bend. (D) Light cannot enter a denser medium

28. Solar cell converts :

(A) heat energy to electrical energy (B) heat energy to light energy

(C) light energy to electrical energy (D) light energy to chemical energy

29. A current of 2.5 A enters at A and leaves at B . The potential difference between the points A and B will be:



(A) 15 Volts (B) 24 Volts

(C) 60 Volts (D) 50 Volts

30. A person holds a mass of 100 Kg for 1 hour. Work done is:

(A) 100 J (B) 6000 J (C) 360000 J (D) Zero

SPACE FOR ROUGH WORK

PART C : MATHS

Q.31 to Q.60 has four choices (A), (B), (C), (D) out of which only **ONE** is correct.

31. If a and b are rational no. and $\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}} = a + b\sqrt{15}$, then a + b = ?

(A) 0 (B) 1 (C) 31 (D) 5

32. If least prime factor of a is 3 and least prime factor b is 7, the least prime factor of (a + b) is

(A) 2 (B) 3 (C) 5 (D) 11

33. A man on the top of vertical tower observes a car moving at a uniform speed coming directly towards the foot of the tower. If it takes 12 minutes for the angle of depression to change from 30º to 45º, After this it will reach the tower in

(A) $\frac{12}{\sqrt{3}-1}$ minutes (B) $(\sqrt{3}+1)$ minutes

(C) $\frac{12}{\sqrt{3}+1}$ minutes (D) $6(\sqrt{3}-1)$ minutes

34. If a cone is cut into two parts by a horizontal plane passing through the midpoint of its axis, the ratio of the volumes of the upper part and the cone is :-

(A) 8 : 1 (B) 3 : 2 (C) 2 : 3 (D) 1 : 8

SPACE FOR ROUGH WORK

35. Cards marked with the numbers 3, 4, 5, ..., 50 are placed in a box and mixed thoroughly. One card is drawn at random from the box. The probability that number on the drawn card is a number which is a perfect square, is _____.

(A) $\frac{1}{8}$ (B) $\frac{2}{8}$ (C) $\frac{3}{8}$ (D) $\frac{5}{8}$

36. The area of quadrilateral, coordinates of whose vertices are (1,2), (6,2), (5, 3) and (3,4), is

(A) $\frac{11}{2} sq.unit$ (B) $\frac{13}{2} sq.unit$ (C) 6 sq. unit (D) 5 sq. unit

37. The sum of three numbers in A.P. is 27 and the sum of their squares is 293, then one of the numbers is

(A) 4 (B) 8 (C) 12 (D) 10

38. If the system of equations

$x - ky = 2$

$3x + 2y = -5$

has a unique solution, then

(A) $k = -2/3$ (B) $k = -3/2$ (C) $k \neq -2/3$ (D) $k \neq -3/2$

39. Find the sum of all the three digit numbers which leave the remainder 2 when divided by 5 :-

(A) 98910 (B) 68610 (C) 100910 (D) None of these

SPACE FOR ROUGH WORK

40. If $a + b + c = 9$ and $ab + bc + ca = 23$ then $a^3 + b^3 + c^3 - 3abc =$

(A) 108 (B) 207 (C) 669 (D) 729

41. If $\sqrt{2^n} = 1024$ then $3^{2\left(\frac{n}{4}-4\right)}$

(A) 3 (B) 9 (C) 27 (D) 81

42. If $\theta = 45°$ then $\frac{\tan^2\theta - 1}{\sec^2\theta} =$

(A) 1 (B) –1 (C) 0 (D) 2

43. On selling a tea-set at 5% loss and a lemon-set at 15% gain, a shopkeeper gains Rs. 84. However, if he sells the tea-set at 5% gain and the lemon-set at 10% gain, he gain Rs. 104. Find the price of the tea-set and that of the lemon-set respectively paid by the shopkeeper.

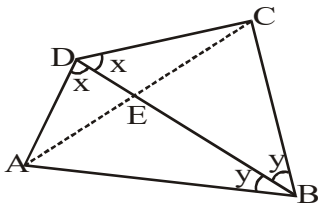
(A) Rs. 500, Rs. 800 (B) Rs. 576, Rs. 752

(C) Rs. 800, Rs. 500 (D) Rs. 752, Rs. 576

44. The diagonal BD of a quadrilateral ABCD bisects $\angle B$ and $\angle D$, then:

(A) $\frac{AB}{CD} = \frac{AD}{BC}$ (B) $\frac{AB}{BC} = \frac{AD}{CD}$

(C) $AB = AD \times BC$ (D) None of these



SPACE FOR ROUGH WORK

45. 8 men and 12 boys can finish a piece of work in 10 days while 6 men and 8 boys can finish it in 14 days, then the ratio of the time taken by one man alone to that by one boy alone to finish the work is

(A) 1 : 2 (B) 2 : 1 (C) 1 : 1 (D) 1 : 3

46. A loan of Rs 21600 has to be paid in two equal annual installment. If the interest is charged at the rate of 16% per annum, compounded annually, then amount of each installment is

(A) 12456 (B) 13456 (C) 14456 (D) 15465

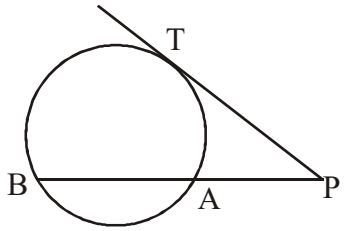
47. A road roller is 140 cm in length and 35 cm in radius. Find how many revolutions it should make to level a play ground of area 308 m^2.

(A) 80 (B) 100 (C) 1000 (D) 10

48. In the figure shown, PT and PAB are the tangent and the secant drawn to a circle. If PT = 12 cm, PB = 18 cm, then AB is

(A) 16 cm (B) 10 cm

(C) $4\sqrt{5}$ cm (D) 18 cm



SPACE FOR ROUGH WORK

49. If the mean of five observations x, x + 2, x + 4, x + 6, x + 8 is 11 then the mean of first three observations is

(A) 8 (B) 7 (C) 9 (D) 10

50. A box contains 5 apples, 6 oranges and 'x' bananas. If the probability of selecting an apple from the box is $\frac{1}{3}$, then the number of bananas in the box is

(A) 4 (B) 6 (C) 8 (D) 5

51. If $x = \frac{4ab}{a+b}$, the value of $\frac{x+2a}{x-2a} + \frac{x+2b}{x-2b}$ is :

(A) 1 (B) -2 (C) 4 (D) 2

52. A cyclist drove 1 km, with the wind in 3 min and drove the same way back, against the wind in 4 min. If we assume that the cyclist always puts constant force on the pedals, how much time would it take to drive 1 km without wind?

(A) $2\frac{1}{3}$min. (B) $3\frac{3}{7}$min. (C) $2\frac{3}{7}$min. (D) $3\frac{7}{12}$min.

SPACE FOR ROUGH WORK

53. A person buys 18 local tickets for Rs. 110. Each first class ticket costs Rs. 10 and each second class ticket costs Rs. 3. What will another lot of 18 tickets in which the number of first class and second class tickets are interchanged cost?

(A) Rs. 112 (B) Rs. 118 (C) Rs. 121 (D) Rs.124

54. A right-angled triangle is formed by the straight line : $4x + 3y = 12$ with both the axis. Then length of perpendicular from the origin to the hypotenuse is :

(A) 3.5 units (B) 2.4 units (C) 4.2 units (D) None of these

55. If the base of two similar triangles are in the ratio 2 : 3, then their perimeters are in the ratio

(A) 4 : 9 (B) 4 : 5 (C) 2 : 3 (D) 3 : 2

56. If the kth term of the arithmetic progression 25, 50, 75, 100, ... is 1000, then k is _____.

(A) 20 (B) 30 (C) 40 (D) 50

57. The point in the plane of a triangle which is at equal perpendicular distance from the sides of the triangle is :

(A) centroid (B) incentre (C) circumcentre (D) orthocentre

SPACE FOR ROUGH WORK

58. The length, breadth and height of a room are 15 m, 12 m and 5 m respectively. Find the cost of painting the four walls of room at the rate of Rs.100 per m^2.

(A) 24000 (B) 26000 (C) 25000 (D) 27000

59. A sphere and cube have the same surface area, the ratio of their respective volumes is

(A) 4 : 3 (B) $\sqrt{6} : \sqrt{\pi}$ (C) $\sqrt{3} : \sqrt{\pi}$ (D) 22 : 7

60. What is the smallest number which when increased by 5 is divisible by 28, 36, 63 and 108 ?

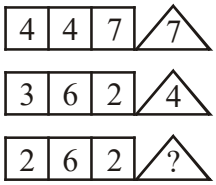
(A) 761 (B) 756 (C) 751 (D) 766

SPACE FOR ROUGH WORK

PART D : MENTAL ABILITY

Q.61 to Q.75 has four choices (A), (B), (C), (D) out of which only **ONE** is correct.

61. Which one will replace the question mark?



(A) 2 (B) 4 (C) 6 (D) 8

62. A man starts from his house and walks 10 km in South direction, then he turns right and goes 6 km, again he turns right and goes 10 km and finally turns right and goes 6 km. At what distance is he from the starting point and in which direction ?

(A) 2 km, North (B) 3 km, South (C) At the starting point (D) 4 km, East

63. In a row of girls, Kamya is fifth from the left and Preeti is sixth from the right. When they exchange their positions, then Kamya becomes thirteenth from the left. What will be Preeti's position from the right?

(A) 7th (B) 11th (C) 14th (D) 18th

64. How many such pairs of digits are there in the number 531268947 each of which has as many digits between them in the number as when they are arranged in descending order?

(A) None (B) One (C) Two (D) More than three

SPACE FOR ROUGH WORK

65. It being given that × denotes 'greater than ', f denotes 'equal to' < denotes 'not less than', ^ denotes 'not equal to', D denotes 'less than' and + denotes 'not greater than', choose the correct statement from the following :

If a × b D c, it follows that

(A) a f c D b (B) b < a × c (C) a < b + c (D) c + b < a

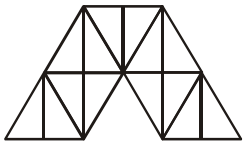
66. Which of the following has fractions in ascending order?

(A) $\frac{2}{3},\frac{3}{5},\frac{7}{9},\frac{9}{11},\frac{8}{9}$ (B) $\frac{3}{5},\frac{2}{3},\frac{9}{11},\frac{7}{9},\frac{8}{9}$ (C) $\frac{3}{5},\frac{2}{3},\frac{7}{9},\frac{9}{11},\frac{8}{9}$ (D) $\frac{8}{9},\frac{9}{11},\frac{7}{9},\frac{2}{3},\frac{3}{5}$

67. Hari singh can cover a circular path of radius 21 m. in 44 sec. He will cover a distance of 3km in :-

(A) 16 min. 20 secs (B) 16 min. 40 secs (C) 18 min. 00 secs (D) 18 min. 30 secs

68. The number of triangles in the given figure is__



(A) 23 (B) 27 (C) 29 (D) 3

SPACE FOR ROUGH WORK

69. If the average of 10, 14 and n is greater than or equal to 8 and less than or equal to 12, what is the least possible value of n ?

(A) –12 (B) – 6 (C) 0 (D) 6

70. A sum was put at simple interest at a certain rate for 2 years. Had it been put at 3% higher rate, it would have fetched Rs. 72 more find the sum :

(A) Rs. 1000 (B) Rs. 1200 (C) Rs. 500 (D) Rs. 150

71. A solid cube of 4 inches has been painted red, green and black on pair of opposite faces. It has been cut into one inch blocks. How many cubes have only one face painted ?

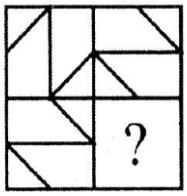
(A) 0 (B) 8 (C) 16 (D) 24

72. In a certain code language, Alpha-Beta-Phai means Machine is running, Phai-Kappa-Theata-Alpha means Bus is not running and Theata-Phai-Gamma-Alpha means Car is not running. Which word in that language means Bus ?

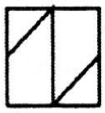
(A) Alpha (B) Beta (C) Phai (D) Kappa

SPACE FOR ROUGH WORK

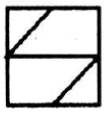
73. Select a figure from amongst the four alternatives, which when placed in the blank space of fig. (X) would complete the pattern.



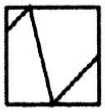
(X)



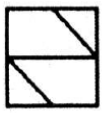
(A)



(B)



(C)



(D)

74. Find the next term in the alpha-numeric series:

Z1A, X2D, V6G, T21J, R88M, P445P, ?

(A) N2676S (B) N2676T (C) T2670N (D) T2676N

SPACE FOR ROUGH WORK

75. Which of the figures (1), (2), (3) and (4) will be the answer figure if the following rule is applied to figure (X) ?

Rule : The curves should become straight lines and the straight lines should become curves

Figure (X)

(A) 

(B) 

(C) 

(D) 

SPACE FOR ROUGH WORK

Spectrum

Answer Key

Target : JEE

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13
Ans.	A	B	C	A	C	A	D	D	B	C	D	B	D
Que.	14	15	16	17	18	19	20	21	22	23	24	25	26
Ans.	A	A	A	A	D	D	B	C	A	A	B	A	D
Que.	27	28	29	30	31	32	33	34	35	36	37	38	39
Ans.	A	C	D	D	D	A	A	D	A	A	A	C	A
Que.	40	41	42	43	44	45	46	47	48	49	50	51	52
Ans.	A	B	C	B	B	A	B	B	B	C	A	D	B
Que.	53	54	55	56	57	58	59	60	61	62	63	64	65
Ans.	D	B	C	C	B	D	B	C	C	C	C	D	C
Que.	66	67	68	69	70	71	72	73	74	75			
Ans.	C	B	C	C	B	24	D	A	A	A			