Spectrum
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Scholarship cum Entrance Exam

SAMPLE TEST PAPER

NAME : _____   Reg. No. : _____

Class: X   *Time:* 2 Hours (09:00 AM to 11:00 AM)

INSTRUCTIONS

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

    Part A contains 10 questions, Part B contains 10 questions, Part C contains 10 questions, Part D contains 20 questions and Part E contains 25 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 only HB pencil or Blue/Black ball 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.10 has four choices (A), (B), (C), (D) out of which only **ONE** is correct.

1. Which of the following sets of elements do not belong to the same group of periodic table?

    (A) F, Cl, Br
    (B) Na, K, Rb
    (C) P, S, Cl
    (D) C, Si, Ge

2. Which of the following formula represents alkenes?

    (A) C_nH_{2n}
    (B) C_nH_{2n+2}
    (C) C_nH_{2n-2}
    (D) C_nH_{2n+1}

3. Which of the following is a decomposition reaction?

    (A) $NaOH + HCl \longrightarrow NaCl + H_2O$
    (B) $NH_4CNO \longrightarrow H_2NCONH_2$
    (C) $2KClO_3 \longrightarrow 2KCl + 3O_2$
    (D) $H_2 + I_2 \longrightarrow 2HI$

4. Which non-metal is the best conductor of electricity –

    (A) Phosphorus
    (B) Fluorine
    (C) Graphite
    (D) Bromine

5. Which of the following elements is metalloid –

    (A) Si
    (B) Al
    (C) Na
    (D) Zn

ROUGH WORK

6. Which metal is higher in the activity series –

(A) K (B) Ca (C) Fe (D) Pt

7. Which of the following statement is correct–

(A) All minerals are ores (B) All ores are minerals

(C) Some ores are minerals (D) None is correct

8. Which of the following is not a strong acid?

(A) H_2SO_4 (B) CH_3COOH (C) HNO_3 (D) HCl

9. Mg^{+2} and F^- ions differ in which of the following fundamental particles ?
(Atomic number Mg = 12, F = 9)

(A) Electrons, protons and neutrons (B) Protons and neutrons

(C) Only protons (D) Neutrons and electrons

10. How many moles and how many atoms are there in 10 grams of calcium ?
(Atomic weight of Ca= 40)

(A) 0.25 moles, 6.023×10^{-23} atoms (B) 0.25 moles, 1.50×10^{23} atoms

(C) 0.1 moles, 6.023×10^{23} atoms (D) 0.1 moles, 1.50×10^{-23} atoms
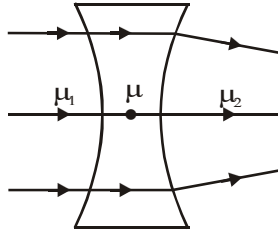

ROUGH WORK

PART B: PHYSICS

**Q.11 to Q.20** has four choices (A), (B), (C), (D) out of which only **ONE** is correct.

11. What is the relation between refractive indices μ, μ_1 and μ_2 if the behaviour of light rays is as shown in fig.

(A) $\mu > \mu_2 > \mu_1$ (B) $\mu < \mu_2 < \mu_1$ (C) $\mu < \mu_2 : \mu = \mu_1$ (D) $\mu_2 < \mu_1 : \mu = \mu_2$

12. The magnification m, the image position v and focal length f are related to one another by the relation -

(A) $m = \dfrac{f-v}{f}$ (B) $m = \dfrac{f}{f-v}$ (C) $m = \dfrac{f+v}{f}$ (D) $m = -\dfrac{f}{f-v}$

13. A galvanometer can be converted into' a voltmeter by connecting

(A) A high resistance in series with the galvanometer.

(B) A high resistance in parallel with the galvanometer.

(C) A low resistance in series with the galvanometer.

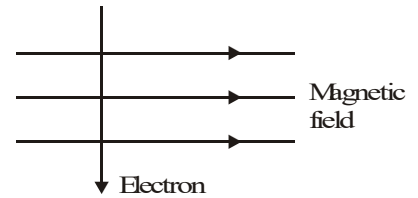(D) A low resistance in parallel with the galvanometer.

ROUGH WORK

14. The resistance between points A and B in Fig. is :-
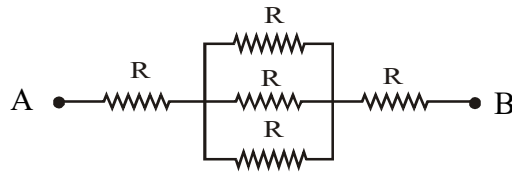
(A) $\dfrac{7}{3}$ R   (B) 3R   (C) 5R   (D) $\dfrac{4}{3}$ R

15. An electron enters a magnetic field at right angles to it as shown in figure. The direction of force acting on the electron will be

(A) To the right

(B) To the left

(C) Out of the page

(D) Into the page.

Magnetic field

Electron

16. A 24 V potential difference is applied across a parallel combination of four 6-ohm resistors. The current in each resistor is

(A) 1A   (B) 4A   (C) 16 A   (D) 36 A

ROUGH WORK

17. The momentum of a body is numerically equal to the kinetic energy of the body. What is the velocity of the body?

(A) $\dfrac{1}{\sqrt{2}}$ units   (B) 2 units   (C) $\dfrac{1}{\sqrt{3}}$ units   (D) $\sqrt{3}$ units

18. The minimum linear distance between a compression and a rarefaction or a crest and a trough of a wave is : (where l is wavelength)

(A) $\dfrac{\lambda}{2}$ (B) $\dfrac{\lambda}{4}$ (C) l   (D) $\dfrac{3\lambda}{2}$

19. A truck starts from rest and rolls down the hill with a constant acceleration. It travels 400 m in 20 s. If the mass of truck is 7 metric tonnes, the force acting on it is:

(A) 28,000 N   (B) 14,000 N   (C) 1400 N   (D) 24,000 N

20. Two bodies of masses 1 kg and 2 kg respectively are placed at a separation of 1 m. Find the accelerations of the bodies assuming that only gravitational force acts between them :-

(A) 1.33×10^{-10} & 6.67×10^{-11} m/s²   (B) 1.33×10^{-11} & 6.25×10^{-11} m/s²

(C) 5.36×10^{-11} & 5.26×10^{-11} m/s²   (D) 3.11×10^{-11} & 5.26×10^{-11} m/s²

ROUGH WORK

PART C: BIOLOGY

Q.21 to Q.30 has four choices (A), (B), (C), (D) out of which only **ONE** is correct.

21. The blood leaving the tissues becomes richer in :
    (A) Carbon dioxide   (B) Water   (C) Haemoglobin   (D) Oxygen

22. Which is the first enzyme to mix with food in the digestive tract ?
    (A) Pepsin   (B) Cellulase   (C) Amylase   (D) Trypsin

23. Match the words of Column (A) with that of Column (B) :
    Column - A   *Column - B*
    p- Phloem   i- Excretion
    q- Nephron   ii- Translocation of food
    r- Veins   iii- Clotting of blood
    s- Platelets   iv- Deoxygenated blood
    (A) p-i, q-ii, r-iii, s-iv   (B) p-ii, q-i, r-iii, s-iv
    (C) p-ii, q-i, r-iv, s-iii   (D) p-i, q-iii, r-iv, s-ii

24. Posture and balance of the body controlled by :
    (A) Cerebrum   (B) Cerebellum   (C) Medulla   (D) Pons

25. Which of the following is not a part of the female reproductive system in human beings ?
    (A) Ovary   (B) Uterus   (C) Vas deferens   (D) Fallopian tube

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ROUGH WORK

26. Offspring formed by asexual method of reproduction have greater similarity among themselves because -
i- Asexual reproduction involve only one parent
ii- Asexual reproduction does not involve gametes
iii- Asexual reproduction occurs before sexual reproduction
iv- Asexual reproduction occurs after sexual reproduction
(A) i and ii   (B) i and iii   (C) ii and iv   (D) iii and iv

27. A cross between a tall plant (TT) and short pea plant (tt) result in progeny that were all tall plants because :
(A) Tallness is dominant trait
(B) Shortness is a dominant trait
(C) Tallness is a recessive trait
(D) Height of pea plant is not governed by gene 'T' or 't '

28. A basket of vegetables contains carrot , potato, radish, and tomato. Which of them represent the correct homologous structures ?
(A) Carrot and potato   (B) Carrot and tomato
(C) Radish and carrot   (D) Radish and potato

29. Typhoid is caused by -
(A) Escherichia   (B) Giardia   (C) Salmonella typhi   (D) Shigella

30. In a food chain , the third trophic level is always occupied by :
(A) Carnivores   (B) Herbivores   (C) Decomposers   (D) producers

ROUGH WORK

PART D: MATHEMATICS

Q.31 to Q.50 has four choices (A), (B), (C), (D) out of which only **ONE** is correct.

31. Find the value of x then $\left(\dfrac{3}{5}\right)^{2x-3} = \left(\dfrac{5}{3}\right)^{x-3}$

   (A) x = 2   (B) x = – 2   (C) x = 1   (D) x = – 1

32. If α and β are the zeros (or roots) of the polynomial $f(x) = 16x^2 + 4x - 5$ then $\dfrac{1}{\alpha} + \dfrac{1}{\beta}$ is equal to

   (A) $\dfrac{2}{5}$ (B) $\dfrac{5}{2}$ (C) $\dfrac{3}{5}$ (D) $\dfrac{4}{5}$

33. The pair of linear equations $x + 2y = 5$, $3x + 12y = 10$ has

   (A) Unique solution   (B) No solution

   (C) More than two solutions   (D) Infinitely many solutions

34. A fraction becomes $\dfrac{4}{5}$ when 1 is added to each of the numerator and denominator. However, if we subtract 5 from each then it becomes $\dfrac{1}{2}$. The fraction is

   (A) $\dfrac{5}{8}$ (B) $\dfrac{5}{6}$ (C) $\dfrac{7}{9}$ (D) $\dfrac{13}{16}$

35. If $\cos\theta + \sec\theta = 2$, then the value of $\cos^2\theta + \sec^2\theta$ is

   (A) 1   (B) 2   (C) 4   (D) None of these

ROUGH WORK

36. If $x = \sqrt{2 + \sqrt{2 + \sqrt{2 + ... + \infty}}}$ then x is

(A) 1   (B) 2   (C) 3   (D) None of these

37. The mean of the following data is 18.75 then the value of p is

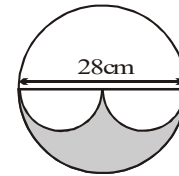| x_i	10	15	p	25	30
f_i	5	10	7	8	2

(A) 21   (B) 20.6   (C) 20   (D) 22

38. If 7th and 13th terms of an A.P. be 34 and 64, respectively, then it's 18th term is

(A) 87   (B) 88   (C) 89   (D) 90

39. In the given figure, the area of shaded region is

(A) 462 cm^2 (B) 308 cm^2

(C) 616 cm^2 (D) 154 cm^2

28cm

40. The co-ordinates of the points which divides the join of $(-2, -2)$ and $(-5, 7)$ in the ratio $2 : 1$ (internally) is

(A) (-4, 4)   (B) (3, 1)   (C) (4, 4)   (D) (1, 3).

ROUGH WORK

41. What is the probability that the number selected from the numbers 1, 2, 3, ..., 20, is a prime number when each of the given numbers is equally likely to be selected ?
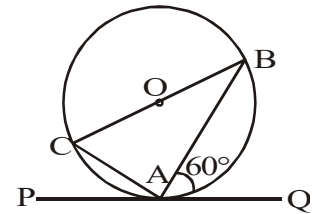
(A) $\dfrac{7}{10}$ 　　　　(B) $\dfrac{2}{15}$ 　　　　(C) $\dfrac{2}{5}$ 　　　　(D) $\dfrac{3}{5}$

42. A hollow cylindrical pipe is 21 cm long. If its outer and inner diameters are 10 cm and 6 cm respectively, then the volume of the metal used in making the pipe is (Take $\pi = \dfrac{22}{7}$)

(A) 1048 cm^3 　　　　(B) 1056 cm^3 　　　　(C) 1060 cm^3 　　　　(D) 1064 cm^3

43. In the given figure, PAQ is the tangent. BC is the diameter of the circle. if $\angle BAQ = 60°$, find $\angle ABC$

(A) 25° 　　　　(B) 30°

(C) 45° 　　　　(D) 60°

44. If x is the length of a median of an equilateral triangle, then its area is :

(A) x^2 　　　　(B) $\dfrac{x^2 \sqrt{3}}{2}$ 　　　　(C) $\dfrac{x^2 \sqrt{3}}{3}$ 　　　　(D) $\dfrac{x^2}{2}$
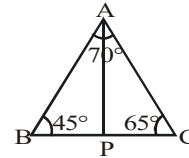

ROUGH WORK

45. Two adjacent sides of a parallelogram are 5 cm and 3.5 cm. One of its diagonals is 6.5 cm. Then the area of paralleogram is :-

(A) $5\sqrt{3}$ cm^2 (B) $10\sqrt{3}$ cm^2 (C) $15\sqrt{3}$ cm^2 (D) $20\sqrt{3}$ cm^2

46. In $\triangle ABC$ if $\angle B = 45°$, $\angle C = 65°$, and the bisector of $\angle BAC$ meets BC at P. Then the ascending order of sides is :-

(A) AP, BP, CP

(B) AP, CP, BP

(C) BP, AP, CP

(D) CP, BP, AP

47. If the roots of the equation $\dfrac{x^2 - bx}{ax - c} = \dfrac{m-1}{m+1}$ are equal and of opposite sign, then the value of m will be -

(A) $\dfrac{a-b}{a+b}$ (B) $\dfrac{b-a}{a+b}$ (C) $\dfrac{a+b}{a-b}$ (D) $\dfrac{b+a}{b-a}$

ROUGH WORK

SET

48. If $5 \sin\theta = 3$, then $\dfrac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta}$ is equal to :

(A) $\dfrac{1}{4}$ 　　　　　(B) 4 　　　　　(C) 2 　　　　　(D) None of these

49. If $16 \times 8^{n+2} = 2^m$, then m is equal to –

(A) n + 8 　　　　　(B) 2n + 10 　　　　　(C) 3n + 2 　　　　　(D) 3n + 10

50. In an A.P. sum of first 3 terms $(s_3) = 6$ and sum of first 6 terms $(s_6) = 3$, then it's common difference is equal to :

(A) 3 　　　　　(B) – 1 　　　　　(C) 1 　　　　　(D) None of these

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ROUGH WORK

PART E: MENTAL ABILITY

Q.51 to Q.75 has four choices (A), (B), (C), (D) out of which only **ONE** is correct.

51.   Shantha and Uma start from a fixed point. Shantha moves 3 km northward and turns right and then covers 4 km. Uma moves 5 km westward, turns right and walks 3 km. The distance between Shantha and Uma now is

(A) 10 km   (B) 9 km   (C) 8 km   (D) 6 km

52.   A dice has numbers 1, 2, 3, 4, 5 and 6 on its faces. Four positions of the dice are as shown below. The number on the face opposite to the face with number 2 is ____.
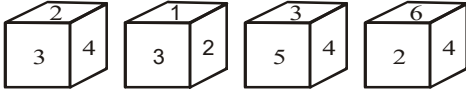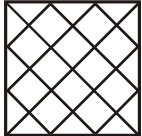

(A) 6   (B) 5   (C) 4   (D) 1

53.   How many times will you write even numerals if you write all the numbers from 291 to 300?

(A) 11   (B) 13   (C) 15   (D) 17

54.   Find the number of triangles in the following figure.

(A) 28

(B) 32

(C) 36

(d) 40

ROUGH WORK

55.

18	24	32
12	14	16
3	?	4
72	112	128

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

Directions : In each of the question (56-58)

  Δ **means** $\neq$ $\div$ **means** $\geq$ $\square$ **Stands for** $\leq$

= **means** $<$ + **means** $>$ **x means** =

**Find the correct answer for each question**

56. If a $\square$ b and b = c, then.

(A) c + a   (B) a + c   (C) c $\square$ a   (D) c $\times$ a

57. If c $\square$ a and a $\times$ b, then.

(A) c $\div$ b   (B) b $\square$ c   (C) c $\square$ b   (D) b = c

58. If a + b and b + c then.

(A) c $\div$ a   (B) a = c   (C) a $\square$ c   (D) c = a

ROUGH WORK

Dirctions (59-61) : Study the following letter/number series to answer there questions.
F 6 Z 7 1 T 3 U X R 5 2 9 P 4 B A 7 8 D 4 6 F G H 2 P 3 Q R .

59. How many letters are there in the series which are immediately preceded as well as immediately followed by a number?

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

60. How many numbers are there in the series which are immediately preceded by a number and immediately followed by a letter?

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

61. If all the numbers are dropped from the series and the order of letters is reversed, which letter will be 6th to the right of fifth letter from left?

    (A) F   (B) X   (C) R   (D) G

62. Which one of the answer figures shall complete the given pattern ?

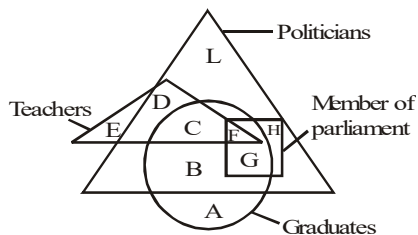Problem figure

(A)   (B)   (C)   (D)
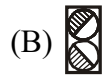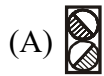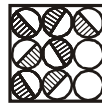
ROUGH WORK

Direction (63-65) : In the following figure, the smaller triangle represents the teachers, the big triangle represents the politicians, the circle represents the graduates and the rectangle represents the member of parliament.
Different regions are being represented by letters of English alphabets.

63. Who among the following are graduates or teachers but not politicians?
   (A) B,G   (B) G,H   (C) A,E   (D) E,F

64. Who among the following politicians are graduates but not the members of parliament?
   (A) B,C   (B) L,B   (C) D,L   (D) A,H,L

65. Who among the following politicans are neither teachers nor graduates?
   (A) E,F   (B) D,E   (C) C,D   (D) L,H

66. What number is one half of one quater of one tenth of 800?
   (A) 0   (B) 10   (C) 4   (D) 20

ROUGH WORK

67. The table shows numbers in Set X and Set Y. What do the numbers in sex X have in common that the number in Set Y do not?
(A) They are all 1 more than a multiple of 5
(B) They are all multiple of 6
(C) They are all less than 27
(D) They are all even

Set X	Set Y
6	5
16	7
21	17
26	21

68. If DELHI is coded as 73541 and CALCUTTA as 82589662, how can CALICUT be coded?
(A) 5279431 (C) 5978213
(B) 8251896 (D) 8543691

69. A bus for Delhi leaves every thirty minutes from a bus stand. An enquiry clerk told a passenger that the bus had already left ten minutes ago and the next bus will leave at 9.35 am. At what time did the enquiry clerk give this information to the passenger?
(A) 9.10 am   (B) 8.55 am   (C) 9.08 am   (D) 9.15 am

70. If each of the odd digits in the number 54638 is decreased by 1 and each of the even digits is increased by 1, then which of the following will be the sum of the digits of the new number?
(A) 25   (B) 26   (C) 28   (D) 27

ROUGH WORK

Directions (Q.No. 71 to 73) : Read the following information carefully and answer the questions given below it :

A,B,C,D,E, F and G are playing cards sitting in a circle.

(i) F is 2nd to the right of G.

(ii) B is neighbour of F but not of E.

(iii) E is neighbour of C, is 4th to the right of G.

(iv) D is between E and A.

71. Who is fourth to the left of G?

   (A) D   (B) E   (C) C   (D) None of these

72. Who is to the left of G?

   (A) A   (B) C   (C) B   (D) None of these

73. Who are the neighbours of F?

   (A) E and C   (B) F and B   (C) A and B   (D) C and B

ROUGH WORK

74. A cube is coloured red on all faces. It is cut into 64 smaller cubes of equal size. How many cubes have no face coloured ?

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

75. If the seventh day of a month is three days earlier than Friday, what day will it be on the nineteenth day of the month?

(A) Sunday   (B) Monday   (C) Wednesday   (D) Friday

ROUGH WORK