SEAL

Test Booklet Number	Test - 1001	Roll Number
04008	**MATHEMATICS & SCIENCE**	
[Time : 2 Hours]		[Maximum Marks : 300]

INSTRUCTIONS TO CANDIDATES

Read the following instructions carefully before you answer the questions given in this Test Booklet :

1. Answers to questions in this Test Booklet are to be given on a computerised **Answer Sheet** provided to the candidate **separately.**
2. Candidate must fill up Name, Category, Test Booklet Number, Subject Code and Roll Number in the answer sheet carefully as per instructions given.
3. This Test Booklet consists of 75 questions. All questions are compulsory and carry equal marks.
4. Each question in this Test Booklet has four possible alternative answers namely, (a), (b), (c) and (d), one of which is correct. Candidate should choose the correct answer against each question out of four alternative answers.
5. Candidate is instructed to answer the questions by **darkening (●)** with **Ball Point Pen** only in the circle bearing the correct answer.
6. Candidate should not attempt more than one answer in each question. More than one attempt in any form against a question shall be treated as incorrect.
7. Marking of answer other than darkening shall be cancelled and darkening should remain within the circle or otherwise computer shall not accept during evaluation of answer-script.
8. Rough work must not be done on the Answer Sheet. Use the blank space given in the Test Booklet for rough work.
9. Candidate is to hand over the Answer sheet to the Invigilator before leaving the Examination Hall.
10. **NEGATIVE MARKING** : Each question carries 4 (four) marks for correct response. For each incorrect response, 1 (one) mark will be deducted from the total score. More than one answer indicated against a question will be deemed as incorrect response and will be negatively marked.

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SET - I (MATHEMATICS)

1. If $\frac{3+2\sqrt{2}}{3-\sqrt{2}} = x + \sqrt{2}y$, then $(x + y)$ equals

   a) $\frac{13}{7}$

   b) $\frac{9}{7}$

   c) $\frac{22}{7}$

   d) $\frac{4}{7}$

2. If $a + b + c = 12$, then the value of $(4 - a)^3 + (4 - b)^3 + (4 - c)^3 - 3(4 - a)(4 - b)(4 - c)$ is

   a) 0

   b) -1

   c) 1

   d) 2

3. The value of p if $(x - 3)$ is a factor of $p^2x^3 - px^2 + 3px - p$ is

   a) 27

   b) -27

   c) $\frac{1}{27}$

   d) $-\frac{1}{27}$

4. If $\frac{x}{a} + \frac{y}{b} = 2$ and $ax - by = a^2 - b^2$ the value of $(x \div y)$ is

   a) $\frac{a}{b}$

   b) $\frac{-a}{b}$

   c) $\frac{-b}{a}$

   d) $\frac{b}{a}$

5. If $x = 2$ is a solution of the equation $\frac{4(x+1)}{3} - \frac{3x}{2} = \frac{5a+2}{7}$, the value of a is

   a) 0

   b) 1

   c) -1

   d) -2

6. The line segment joining the points A (2, 1) and B (5, –8) is trisected at the point P and Q such that P is nearer to A. If P lies on the line given by $2x - y + k = o$, then the value of K is :

   a) 8

   b) -8

   c) -4

   d) 4

7. If the roots of the equation $(a - b)x^2 + (b - c)x + (c - a) = 0$ are equal, then

   a) $2b = a + c$

   b) $2a = b + c$

   c) $2c = a + b$

   d) $2a = b - c$

8. The equation, whose roots are twice the roots of $x^2 - 5x + 7 = 0$ is

   a) $x^2 - 10x + 14 = 0$

   b) $x^2 - 10x + 28 = 0$

   c) $2x^2 - 10x + 14 = 0$

   d) $4x^2 - 10x + 15 = 0$

9. Flower pots are arranged in rows. If the number of flower pots in a row in increased by three, there is one row less. If the number of flower pots in a row is decreased by 5, then there are three more rows. The total number of flower pots is

a) 60
b) 75
c) 90
d) 120

10. The number of three digit numbers which are divisible by 6 are :

a) 148
b) 149
c) 150
d) 151

11. The three sides of a right triangle have integral lengths which form an AP. One of the sides could have length

a) 22
b) 58
c) 81
d) 91

12. In a right angled triangle, the square of the hypotenuse is equal to twice the product of the other two sides. One of the acute angles of the triangle is

a) 60°
b) 45°
c) 30°
d) 75°

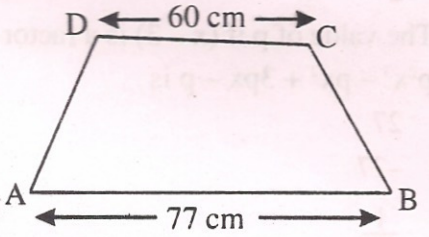
13. In a ΔABC if $2\angle A = 3\angle B = 6\angle C$, then $\angle A, \angle B, \angle C$, respectively are

a) 30°, 60°, 90°
b) 90°, 60°, 30°
c) 30°, 90°, 60°
d) 60°, 90°, 30°

14. $\Delta ABC \sim \Delta PQR$. If AB = 6 cm, BC = 4 cm, AC = 8 cm and PR = 6 cm, then PQ + QR =

a) 8 cm.
b) 10 cm.
c) 7.5 cm.
d) 9 cm.

15. ABCD is a trapezium in which AB = 77 cm, BC = 25 cm, CD = 60 cm and AD = 26 cm. The height of the trapezium is



a) 12 cm.
b) 18 cm.
c) 24 cm.
d) 30 cm.

16. The perimeter of a right triangle is 60 cm. Its hypotenuse is 26 cm. The area of triangle is

a) 120 cm^2
b) 195 cm^2
c) 390 cm^2
d) 780 cm^2

17. The radius of a circle is 2.5 cm. AB and CD are two parallel chords 2.7 cm. apart. If AB = 4.8 cm. then CD is equal to

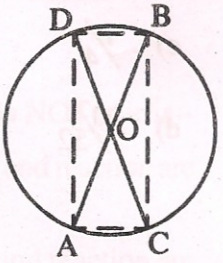
a) 4.8 cm.

b) 2.4 cm.

c) 3 cm.

d) 4 cm.

18. AB and CD are diameters of a circle with centre O, then ACBD is



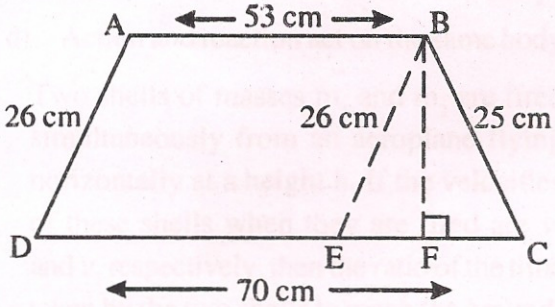
a) a square

b) a trapezium

c) isosceles trapezium

d) rectangle

19. The area of trapezium ABCD in the adjoining figure is



a) 1022 cm^2

b) 1233 cm^2

c) 1476 cm^2

d) 1742 cm^2

20. The radius and height of a right circular cone are in the ratio of 5 : 12. If its volume is 314 cu.cm (where $\pi = 3.14$), the slant height of the cone is

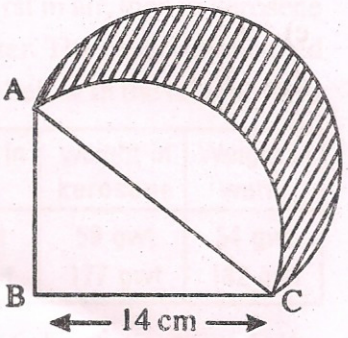
a) 26 cm

b) 19.5 cm

c) 13 cm

d) 6.5 cm

21. In the figure, ABC is a quadrant of a circle of radius 14 cm. and on AC as diameter, a semicircle is drawn. The area of shaded region is $\left(\text{Use } \pi = \frac{22}{7}\right)$



a) 49 cm^2

b) 98 cm^2

c) 147 cm^2

d) 198 cm^2

22. If $\tan\theta + \sin\theta = m$, $\tan\theta - \sin\theta = n$, then

a) $m^2 - n^2 = 2mn$

b) $m^2 + n^2 = -2mn$

c) $m^2 + n^2 = 4\sqrt{mn}$

d) $m^2 - n^2 = 4\sqrt{mn}$

23. The angle of elevation of the top of the tower from two points at distances of 25 m and 36 m from the base of the tower and in the same straight line with it are complementary. The height of the tower is

a) 20 m

b) 30 m

c) 40 m

d) 50 m

24. The mean of the following distribution

Classes	0-20	20-40	40-60	60-80	80-100
Frequency	7	11	10	9	p

is 54. The value of p is

a) 13

b) 11

c) 9

d) –7

25. The king, queen and jack of clubs are removed from a deck of 52 cards and the remaining cards are well shuffled. A card is then drawn from the remaining cards. The probability of getting a card of clubs is

a) $13/49$

b) $10/49$

c) $1/4$

d) $10/52$

SET - II (PHYSICS)

26. A body of mass 'm' moving with a velocity 'v' comes to rest under the action of a force 'F' in time 't'. If the body covers a distance 's' during this time interval, then

a) $F \times s = mv/t$

b) $s = \frac{1}{2}vt$

c) $F \times t = mvs$

d) $v = s/t$

27. The only statement which is NOT true is–

a) The magnitudes of action and reaction are equal

b) The directions of action and reaction are opposite

c) Action and reaction act simultaneously

d) Action and reaction act on the same body

28. Two shells of masses m_1 and m_2 are fired simultaneously from an aeroplane flying horizontally at a height h. If the velocities of these shells when they are fired are v_1 and v_2 respectively, then the ratio of the time taken by the two shells to reach the ground, i.e. $t_1 : t_2$ is

a) 1 : 1

b) $m_1v_1 : m_2v_2$

c) $m_1v_2 : m_2v_1$

d) $m_1v_2^2 : m_1v_2^2$

29. If a freely falling object covers distances x_1 and x_2 during its first two successive time intervals of same magnitude, then the ratio x_2/x_1 is

a) 4 : 1

b) 3 : 1

c) 2 : 1

d) 1 : 1

30. A student measured the weights of two stones A and B first in air, then in kerosene and finally in water. The observation noted by him are given below in the tabular form

Stone	Weight in air	weight in kerosene	Weight in water
A	72 gwt	59 gwt	54 gwt
B	216 gwt	177 gwt	182 gwt

The INCORRECT observation recorded by the student is that of the weight of the stone

a) A in kerosene

b) A in water

c) B in kerosene

d) B in water

31. Two children A and B having weights 200 N and 250 N climb to the roof of a tall building in 4 minutes and 5 minutes respectively. Select the CORRECT statement.

a) Work done by child A > Work done by child B

b) Work done by child A = Work done by child B

c) Power of child A > Power of child B

d) Power of child A = Power of child B

32. A student produces transverse waves in a stretched string by fixing its one end and moving continuously its free end up and down. If he increases the speed of up and down motion, then the physical quantity / quantities of the wave which will undergo a change is / are

a) speed only
b) speed and frequency
c) wavelength and frequency
d) frequency only

33. A concave mirror of very large aperture and focal length 1 m is fixed vertically on a wall of a gallery. A boy standing in front at a distance of about 10 m from the mirror walk slowly towards the mirror. As the boy gradually approaches the mirror his image formed by the mirror

a) also gradually approaches the mirror
b) gradually becomes smaller and smaller in size
c) gradually moves away from the mirror
d) changes its nature from internal to real

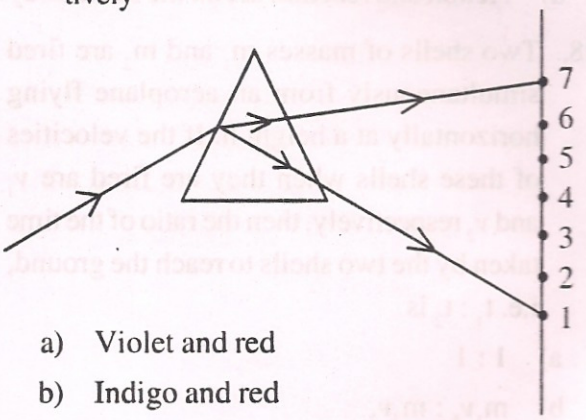
34. An object is placed in front of a concave mirror and its same size image is formed at a distance of 30 cm from the mirror. When this mirror is replaced by another concave mirror, the image seen in the mirror is enlarged and erect. From this information it may be concluded that the focal length of the second mirror is

a) less than 15 cm
b) 15 cm
c) between 15 cm and 30 cm
d) more than 30 cm

35. A child has difficulty in reading the black-board while sitting in the last row. The defect child is suffering from and the nature of lens required for correction respectively are

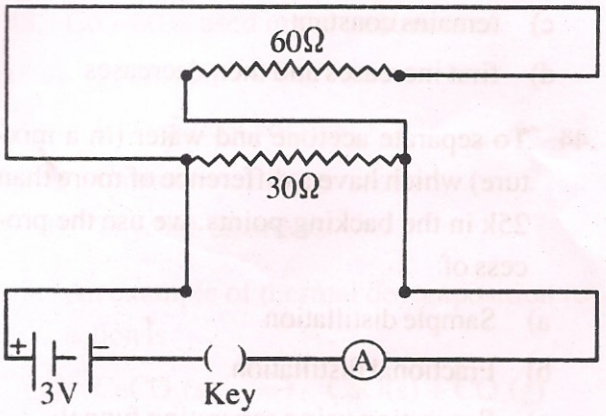
a) myopia ; converging
b) myopia ; diverging
c) hypermetropia ; converging
d) hypermetropia ; diverging

36. A beam of white light incident obliquely on a triangular glass prism is dispersed into its various components as shown. The colours of the components seen at No. 2 and No. 6 position on the screen are respectively



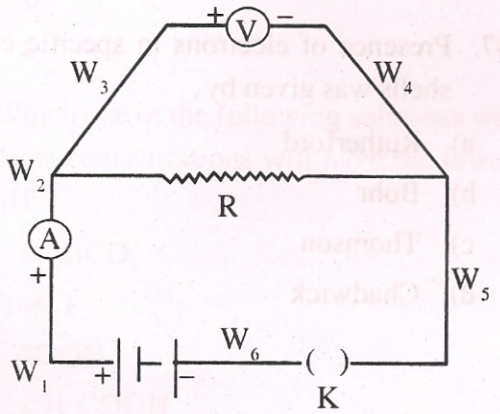
a) Violet and red
b) Indigo and red
c) Blue and orange
d) Indigo and orange

37. Two resistors of 30Ω and 60Ω joined together as shown are connected between two points in a circuit having a battery of 3 V. On closing the key the reading shown by the ammeter will be



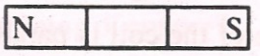
a) myopia ; converging
b) myopia ; diverging
c) hypermetropia ; converging
d) hypermetropia ; diverging

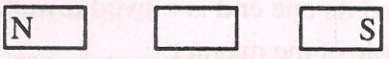
38. Six insulated copper wires W_1, W_2, W_3, W_4, W_5 and W_6 were used by a student in setting up of his circuit for verifying the Ohm's law. He checked the correctness of the ammeter and voltmeter before connecting them in the circuit. On closing the key K he observed a deflection in the ammeter but no deflection in the voltameter. This could be due to break or loose connection or not removing the insulation of the wire

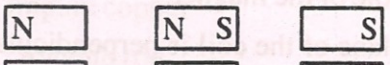


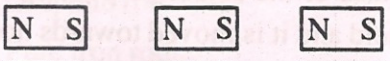
a) W_1 or W_2
b) W_3 or W_4
c) W_5 or W_6
d) W_6 or W_1

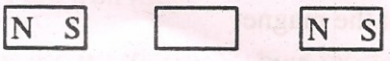
39. When s strongly magnetised steel strip is smoothly cut in three equal parts as shown we get :



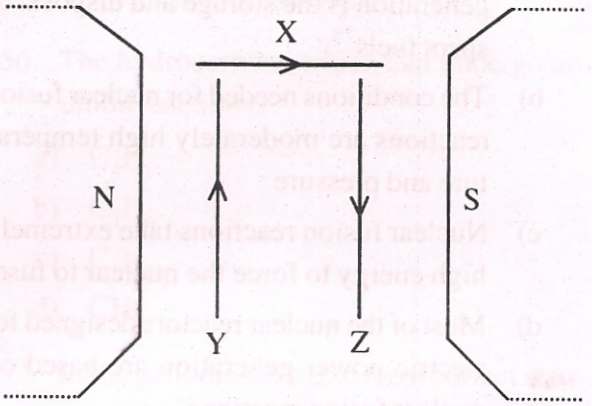
a) 

b) 

c) 

d) 

40. Three current carrying straight conductors are placed between the pole pieces of a strong horse shoe magnet as shown in the diagram. A net force will be experienced by the conductor / conductors



a) X only
b) X and Y
c) Y and Z
d) Z and X

41. A rectangular coil connected to a sensitive galvanometer is placed in the uniform magnetic field of a strong horse shoe magnet. The galvanometer will show a deflection only when

a) plane of the coil is parallel to the field and its one end is moved towards north pole of the magnet

b) plane of the coil is parallel to the field and its one end is moved towards south pole of the magnet

c) plane of the coil is perpendicular to the field and it is moved towards north pole of the magnet

d) plane of the coil is parallel to the field and it is rotated inside the field

42. Select TRUE statement about nuclear fusion reaction.

a) The major hazard of nuclear fusion power generation is the storage and disposal of spent fuels

b) The conditions needed for nuclear fusion reactions are moderately high temperature and pressure

c) Nuclear fusion reactions take extremely high energy to force the nuclear to fuse

d) Most of the nuclear reactors designed for electric power generation are based on nuclear fusion reactions

43. During melting process of a solid temperature

a) increases slowly

b) decreases slowly

c) remains constant

d) first increases and then decreases

44. To separate acetone and water (in a mixture) which have a difference of more than 25k in the backing points, we use the process of

a) Sample distillation

b) Fractional distillation

c) Separation using separating funnel

d) Chromatography

45. Atomic number of sodium, Na is 11 and its mass number is 23. Na^+ ion will have

a) 10 electrons

b) 11 electrons

c) 12 electrons

d) 23 electrons

46. Formula of a compound formed by Fe^{3+} ion and SO_4^{2-} ion is

a) $Fe_2(SO_4)_3$

b) $Fe_3(SO_4)_2$

c) $FeSO_4$

d) $Fe(SO_4)_3$

47. Presence of electrons in specific circular shells was given by

a) Rutherford

b) Bohr

c) Thomson

d) Chadwick

48. Co – 60 is used in the treatment of

a) Leukemia

b) Blockage of arteries

c) Cancer

d) Thyroid disorders

49. An example of thermal decomposition reaction is

a) $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$

b) $2HOCl(ag) \rightarrow O_2(g) + 2HCl(g)$

c) $2AgCl(s) \rightarrow 2Ag(s) + Cl_2(g)$

d) $2H_2O(l) \rightarrow 2H_2(g) + O_2(g)$

50. The metal that forms both a soluble carbonate and a soluble sulphate is

a) Barium

b) Calcium

c) Lead

d) Sodium

51. The pH of the solution which turns red litmus blue is

a) 2

b) 4

c) 6

d) 8

52. Which one of the following solutions with same concentrations will have the lowest pH?

a) $NaHCO_3$

b) HCl

c) NaOH

d) CH_3COOH

53. Which one of the following will be displaced from its salt solution by copper?

a) K^{2+}

b) Ag^{+}

c) Zn^{2+}

d) Al^{3+}

54. Which one is used as an anode in the electrolytic refining of copper?

a) Pure copper

b) Impure copper

c) Graphite rod

d) Pure iron rod

55. The correct statement about most of the carbon compounds is

a) they are soluble in water

b) they furnish ions in aqueous solution

c) their melting points are low

d) they conduct electricity

56. The hydrocarbons which can undergo addition reaction is

a) C_2H_2

b) C_2H_6

c) C_3H_8

d) CH_4

57. In the periodic table, the most correct statement about a period is

a) the first element is an alkali metal and the last element is halogen

b) the first element is a noble gas and the last element is an alkali metal

c) the first element is an alkali metal and the last element is a noble gas

d) Except period 1, the first element is an alkali metal and the last elements has 8 valence electrons

58. Which one of the following statements is not correct about the trends in the properties of the elements of a period on going from left to right?

a) The oxides become more acidic

b) The elements become less metallic

c) The elements lose their electrons more easily

d) There is an increase in the number of valence electrons

59. The gas that is a source of methane, carbon dioxide, hydrogen and hydrogen sulphide is

a) Natural gas

b) Biogas

c) LPG

d) CNG

60. Which one of following is a deficiency disease?

a) hypertension

b) malaria

c) marasmus

d) AIDS

61. Aseel and leghorn are improved breeds of

a) cow

b) buffalo

c) poultry

d) marine fish

62. Which one of the following sets is of mammals?

a) cat, chameleon, camel

b) rat, bat, crocodile

c) platypus, bat, rabbit

d) camel, bat, crocodile

63. Many transplanted seedlings may not survive because

a) the leaves get damaged during the transfer

b) most of the root hairs are lost during transplantation

c) they do not like the new soil

d) they do not get the required mineral salts

64. Which one of the following statements is false?

a) Blood is a fluid connective tissue.

b) Blood has a fluid matrix called plasma.

c) Blood has three kinds of cells.

d) Blood looks red because of haemoglobin present in white blood corpuscles.

65. Which of the following organelles is surrounded by tonoplast?

a) nucleus

b) vacuole

c) lysosomes

d) cytoplasm

66. The chief function of bile is to
    a) digest fats by enzymatic action
    b) emulsify fats for digestion
    c) eliminate waste products
    d) regulate process of peristalsis

67. Oxygenated blood from the lungs is collected by
    a) right ventricle
    b) left atrium
    c) left ventricle
    d) right atrium

68. Urea in human beings is formed in
    a) body tissue
    b) liver
    c) spleen
    d) kidney

69. The part of the brain which controls heart beat and involuntary actions is
    a) cerebellum
    b) cerebrum
    c) hypothalamus
    d) medulla oblongata

70. The sperms are delivered from testes to the urethra through
    a) vas deferens
    b) scrotum
    c) ureters
    d) seminal vesicles

71. A couple has 3 daughters. The probability of the 4th child to be a daughter again is
    a) 4%
    b) 25%
    c) 50%
    d) 75%

72. Potato and sweet potato are example of
    a) analogous organs
    b) same species
    c) vestigial organs
    d) homologous organs

73. Percentage of radiant energy stored by producer is about
    a) 1%
    b) 10%
    c) 30%
    d) 100%

74. Materials present in the remains of dead organisms are degraded by
    a) flies and mosquitoes
    b) bacteria and fungi
    c) viruses
    d) rodents

75. If a lake is contaminated with DDT, the highest concentration of DDT would be found in
    a) algae
    b) protozoans
    c) fish
    d) fish eating birds