# 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 instruction 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 the computer shall not accept during evalu- ation 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 handover both the Test Booklet and Answer Sheet to the Invigilator before leaving the Examination Hall.

10. <u>NEGATIVE MARKING</u> : 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.

MATHEMATICS

1. In a square ABCD, an equilateral triangle DPC is inscribed as shown in the figure.

   The ∠DPC is
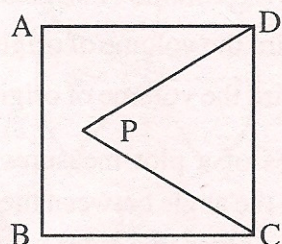
   a) 80°
   b) 120°
   c) 135°
   d) 60°

2. Two numbers are in the ratio of 5 : 7. If 3 is subtracted from each of them the ratio becomes 2 : 3. The numbers are

   a) (15, 21)
   b) (18, 27)
   c) (20, 28)
   d) (10, 15)

3. The diagonals of a quadrilateral ABCD are perpendicular. The quadrilateral formed by joining the mid-points of its sides is

   a) rhombus
   b) rectangle
   c) parallelogram
   d) square

4. AB and CD are two parallel chords of a circle such that AB = 10 cm and CD = 24 cm and they are on opposite sides of the centre. If the distance between the chords is 17 cm, the radius of the circle is

   a) 5 cm
   b) 12 cm
   c) 13 cm
   d) 17 cm

5. Triangles ABC and DBC are two right angled triangles on the opposite sides of the hypotenuse BC. Sides AC and BD, when produced meet at P.

   If AC = 5 cm, CP = 4 cm, DP = 3 cm, then BC is equal to

   a) $\frac{20}{3}$ cm
   b) 9 cm
   c) $\frac{12}{5}$ cm
   d) 7 cm

6. In Δ ABC, D is the mid-point of AB and DE ∥ BC. The ratio of the area of Δ ADE to that of trapezium DBCE is
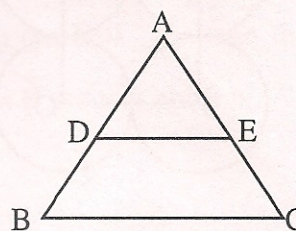
   a) 1 : 2
   b) 2 : 3
   c) 3 : 4
   d) 2 : 3

7. A ladder 13 m long is placed against a wall, reaches a window 12 m. above the ground. Due to some fault, the foot of ladder slipped 7 m. The height of other end of ladder above ground is

 a)   6 m
 b)   12 m
 c)   7 m
 d)   5 m

8. The value of $(x-a)^3 + (x-b)^3 + (x-c)^3$ when $a + b + c = 3x$ is

 a)   0
 b) $a + b + c$
 c) $3(x-a) + (x-b) + (x-c)$
 d)   3abc

9. Four equal circles are drawn, touching each other externally, taking the four corners of a square ABCD as centres. Each side of the square is 14 cm. Area of the part of the square not covered by the circles is
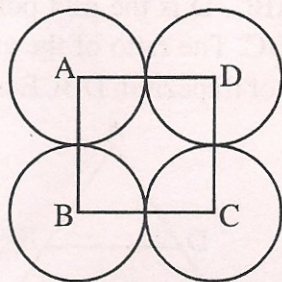

 a)   42 cm^2
 b)   21 cm^2
 c)   84 cm^2
 d)   63 cm^2

10. The height of a cone is doubled and radius is halved. The volume of the new cone equals :

 a)   half the volume of original cone
 b)   double the volume of original cone
 c)   one-third the volume of original cone
 d)   two-third the volume of original cone

11. Two sides of a plot measures 32 m and 24 m and the angle between them is a right angle. The other two sides are 25 m each, none of the remaining three angles is a right angle. The area of the plot of land is
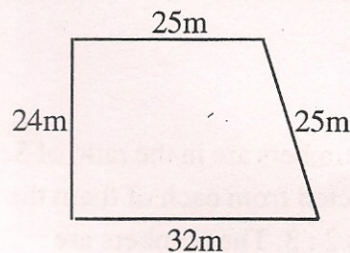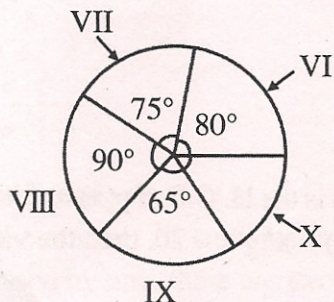

 a)   768 m^2
 b)   534 m^2
 c)   695 m^2
 d)   684 m^2

12. The centroid of a triangle whose two vertices are (−3, 1) and (0, −2) is at the origin. The coordinates of the third vertex are :

 a)   (1, 3)
 b)   (2, 3)
 c)   (3, 2)
 d)   (3, 1)

13. The classwise number of students in a secondary school is shown in the pie chart below :

The number of students in class X is 150. The difference between the number of students in class VIII and VI is :

a) 20

b) 30

c) 50

d) 10

14. 6 female candidates and 12 male candidates contested for the post of Mayor in Municipal Corporation Election. The probability of a male candidate not being elected is :

a) $\dfrac{1}{2}$

b) $\dfrac{1}{3}$

c) $\dfrac{3}{1}$

d) $\dfrac{2}{1}$

15. The mean of the following distribution

Classes	0-10	10-20	20-30	30-40	40-50
Frequency	2	5	p	4	2

is 24.5. The value of p is :

a) 8

b) 7

c) 6

d) 5

16. The angles of elevation of the top of a tower from two points P and Q on the same side of the tower at a distance of 90 m and 40 m respectively, are complementary. The points P, Q and the base of the tower are in the same straight line.

The height of the tower is

a) 45 m

b) 50 m

c) 30 m

d) 60 m

17. In a Δ ABC right angled at C, if tan A = $\dfrac{1}{\sqrt{3}}$ and tan B = $\sqrt{3}$, then the value of sin A cos B + cos A sin B is

a) 0

b) $3\sqrt{3}$

c) $\dfrac{1}{3\sqrt{3}}$

d) 1

18. For $\dfrac{x}{a}\cos\theta + \dfrac{y}{b}\sin\theta = \dfrac{p}{2}$ and

$\dfrac{x}{a}\sin\theta - \dfrac{y}{b}\cos\theta = -\dfrac{p}{2}$, which one of the following statements is correct?

a) $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = p^2$

b) $\dfrac{x^2}{a^2} - \dfrac{y^2}{b^2} = -\dfrac{p^2}{2}$

c) $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = -p^2$

d) $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = \dfrac{1}{2}p^2$

19. Anita puts Rs. 20,000 in a fixed deposit account with a bank for 2 yrs at the rate of 10% compounded annually. The maturity value of the Fixed Deposit is

a) Rs. 24,200
b) Rs. 22,400
c) Rs. 21,400
d) Rs. 24,000

20. A computer is available for Rs. 91,000 cash or Rs. 15,000 as cash down payment followed by three equal monthly instalments of Rs. 26,000 each. The rate of interest under instalment plan is

a) 12%
b) 16%
c) 18%
d) $20\dfrac{3}{5}\%$

21. For the A.P. , $3 + 9 + 15 + \ldots + 213$, the 10th term from the end is

a) 171
b) 159
c) 147
d) 141

22. If $(x + a)$ is the H. C.F of $p(x) = x^2 + 8x + 15$ and $Q(x) = x^2 + x - 20$, then the value of a is

a) 3
b) -5
c) 4
d) 5

23. The value of

$\dfrac{1}{1-x} + \dfrac{1}{1+x} + \dfrac{2}{1+x^2} + \dfrac{4}{1+x^4}$

as a rational expression is

a) $\dfrac{8}{1-x^8}$

b) $\dfrac{-8}{1-x^8}$

c) $\dfrac{8}{1+x^8}$

d) $\dfrac{-8}{1+x^8}$

24. The solutions of the equation :

$abx^2 + (b^2 - ac)x - bc = 0;\ a,\ b \neq 0$ are

a) $\dfrac{c}{b}, \dfrac{-b}{a}$

b) $-\dfrac{c}{b}, \dfrac{b}{a}$

c) $-\dfrac{c}{b}, -\dfrac{b}{a}$

d) $\dfrac{c}{a}, \dfrac{b}{a}$

25. Students of a class are made to stand in rows. If the number of students in a row is increased by one, there are two rows less. If the number of students in a row is decreased by one, then there are three more rows.

The number of students in the class is

a) 120

b) 90

c) 80

d) 60

B - Science (PHYSICS)

26. Two bodies of masses m_1 and m_2 $(m_1 > m_2)$ have equal kinetic energies. If p_1 and p_2 are their respective momenta, the ratio $p_1 : p_2$ is equal to

a) $m_1 : m_2$

b) $m_2 : m_1$

c) $m_1^{1/2} = m_2^{1/2}$

d) $m_1^2 = m_2^2$

27. A 20 N metal block is suspended by a spring balance. A beaker containing some water is placed on a weighing machine which reads 40 N. The spring balance is now lowered so that the block gets completely immersed in the beaker of water. The spring balance now reads 16 N. The reading of the weighing machine will be :

a) 36 N

b) 44 N

c) 56 N

d) 60 N

28. The Displacement – Time graph for a moving object is shown in the figure :
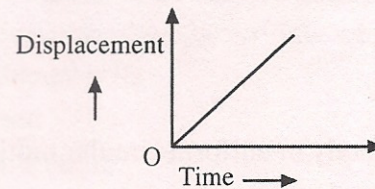
Which one of the following will correspond to its Velocity – Time graph?
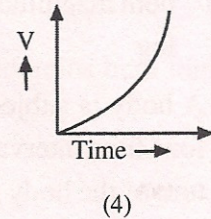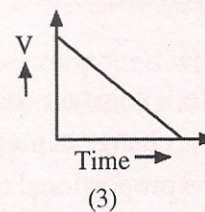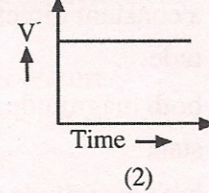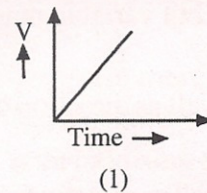
a) 1

b) 2

c) 3

d) 4

29. It is difficult to boil rice at the top of a mountain because

a) water available there is hard

b) it is very cold there

c) the lower atmospheric pressure there lowers the boiling point of water

d) the lower atmospheric pressure there increases the boiling point of water

30. Which one of the following is not a unit of energy?

a) Nm

b) J

c) Wh

d) KW

31. For a body in uniform circular motion, the acceleration has

a) a constant magnitude but variable direction

b) a constant direction but variable magnitude

c) both magnitude as well as direction constant

d) both magnitude as well as direction varying

32. A body is subjected to a constant force F for a time interval t. The change in momentum of the body will be proportional to

a) F alone

b) t alone

c) both F and t

d) neither F nor t

33. Light year is the unit of

a) distance

b) time

c) speed

d) intensity of light

34. The statement not correct out of the following is

a) dry cell is a primary cell.

b) a primary cell is an electro-chemical cell.

c) a primary cell can be recharged.

d) Leclanche cell is used in experiments where constant supply of current is not required.

35. Four identical resistances of one ohm each are connected between two points A and B in two different ways, P and Q as shown.

(P)

(Q)
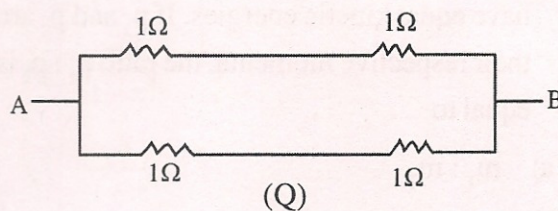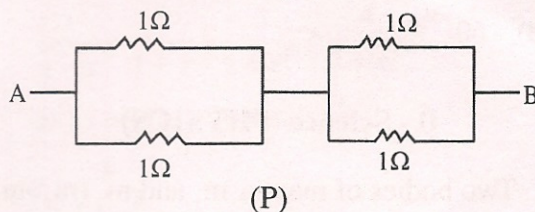
If x and y denote their respective effective resistances between A and B respectively, then

a) x < y

b) x > y

c) x = y

d) x may be less or more than y

36. Magnetic field lines near a long straight wire carrying current are
    a) parallel to the wire
    b) perpendicular to the wire
    c) radial lines originating from the wire
    d) concentric circles passing through wire as centre and normal to the wire

37. Two electric bulbs each of 100 watt and 220 volts are joined in series with the supply of 220 volts, the power loss will be :
    a) 100 watt
    b) 200 watt
    c) 25 watt
    d) 50 watt

38. In a safety fuse, the temperature to which the wire gets heated does **not** depend upon
    a) the radius of the wire
    b) the type of the alloy used
    c) the length of the fuse wire
    d) the magnitude of the current

39. A convex mirror used in an automobile has 3.00 m radius of curvature. If a bus is located at 5.00 m from this mirror, the image formed would be
    a) virtual, upright and smaller in size
    b) virtual, inverted and bigger in size
    c) real, upright and smaller in size
    d) real, inverted and bigger in size

40. A mirage occurs because
    a) the refractive index of air increases with height.
    b) the refractive index of air decreases with height.
    c) refractive index of air does not change with height.
    d) the hot ground acts like a plane mirror.

41. A concave mirror forms an erect image of height h_2 cm of an object of height h_1 cm.

    The ratio $\dfrac{h_2}{h_1}$ is
    a) always greater than 1
    b) always less than 1
    c) always equal to 1
    d) may be less than or equal to 1

42. When light from air enters a glass plate, the physical characteristic for light which does not change is its
    a) speed
    b) wavelength
    c) amplitude
    d) frequency

43. Chlorine is considered an element because chlorine
    a) is a gas at room temperature
    b) has one kind of atoms only
   c) is an oxidising agent
    d) dissolves in water

44. The compound which contains both ionic and covalent bond is
    a) H_2SO_4
    b) C_2H_4
    c) SF_6
    d) $NaCl$

45. For $^{35}_{17}Cl$ and $^{37}_{17}Cl$ which of the following statements is false ?

a) Both have 17 protons
b) Both have 17 electrons
c) Both have 18 neutrons
d) Both show same chemical properties

46. The correct expression for calculating the value of equilibrium constant, k_c for the reaction

$$N_2 \text{ (g)} + 3H_2 \text{ (g)} \rightleftharpoons 2NH_3 \text{ (g)}$$
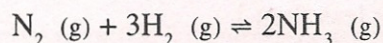
is

a) $k_c = \dfrac{\left[NH_3\right]}{\left[N_2\right]\left[H_2\right]}$

b) $k_c = \dfrac{\left[NH_3\right]^2}{\left[N_2\right]\left[H_2\right]^3}$

c) $k_c = \dfrac{\left[N_2\right]\left[H_2\right]}{\left[NH_3\right]}$

d) $k_c = \dfrac{\left[N_2\right]\left[H_2\right]^3}{\left[NH_3\right]^2}$

47. A 1 M solution of which of the following substances has **lowest** p^H ?
a) Washing Soda
b) Baking Soda
c) Vinegar
d) Lemon Juice

48. In the nuclear fission reaction, energy is released due to
a) chemical reaction
b) conversion of kinetic energy of one of the reactants into heat energy
c) conversion of mass into energy
d) conversion of gravitational energy into heat energy

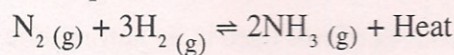49. Soda glass has the composition
a) $Na_2O. CaO. 6SiO_2$
b) $Na_2O. CaO. 2SiO_2$
c) $Na_2O. CaO. 4SiO_2$
d) $Na_2O. CaO. 8SiO_2$

50. The reaction which takes place at the cathode in the electrolytic cell used for extraction of aluminium from alumina is

a) $Al^{3+} + 3e^- \rightarrow Al_{(l)}$
b) $2C_{(S)} + O_{2 (g)} \rightarrow 2CO_{(g)}$
c) $6O^{2-} \rightarrow 3O_2 + 12e^-$
d) $C_{(s)} + O_{2 (g)} \rightarrow CO_{2 (g)}$

51. The equilibrium reaction
$$N_2 \text{ (g)} + 3H_2 \text{ (g)} \rightleftharpoons 2NH_3 \text{ (g)} + Heat$$
will be favoured by
a) low temperature, low pressure
b) high temperature, high pressure
c) low temperature, high pressure
d) high temperature, low pressure

52. On adding concentrated sulphuric acid to sulphur, sulphuric acid is reduced to
a) sulphur
b) sulphur dioxide
c) sulphur trioxide
d) hydrogen sulphide

53. Which one of the following cannot be used for drying CO_2 gas?

 a) P_4O_{10}

 b) Conc. H_2SO_4

 c) Anhydrous $CaCl_2$

 d) Quick-lime

54. Rusting will occur in which of the test tubes given below:
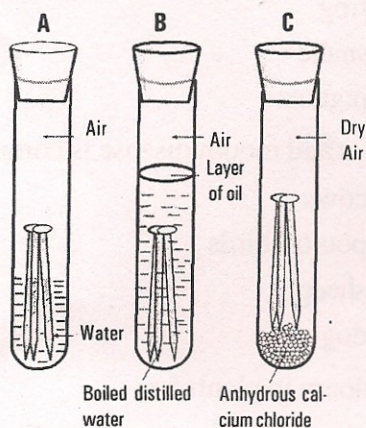
 a) A

 b) B

 c) C

 d) Both B and C

55. The process which is used to separate the components of a petroleum mixture is

 a) addition polymerization

 b) condensation polymerization

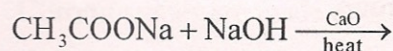 c) fractional distillation

 d) fractional crystallization

56. Alkaline $KMnO_4$ Oxidises ethanol to

 a) diethyl ether

 b) ethanal

 c) ethanoic acid

 d) ethanol oxide

57. Which of the following is a homologue of ethylene C_2H_4?

 a) C_2H_6

 b) C_4H_{10}

 c) C_4H_6

 d) C_5H_{10}

58. In the reaction,

$$CH_3COONa + NaOH \xrightarrow[\text{heat}]{CaO}$$

the gas obtained is

 a) C_2H_6

 b) C_2H_2

 c) CH_4

 d) C_2H_4

59. The organic compound used in the preservation of biological specimens is

 a) aniline

 b) benzene

 c) xylene

 d) formaldehyde

60. Which of the following promotes glucose and amino acid uptake by muscle?

 a) Adrenaline

 b) Insulin

 c) Glucagon

 d) Cortisol

61. Which reproductive adaptation is characteristic of most terrestrial vertebrates but not of most aquatic vertebrates?

a) External fertilization
b) Internal fertilization
c) Motile gametes
d) External development

62. The blood from a donar with AB group can be given to a person with :

a) O - group
b) AB - group
c) A - group
d) B - group

63. A definite pathway for impulses from receptors to effectors is found in the

a) *amoeba*
b) *hydra*
c) earthworm
d) neem tree

64. The number of autosomes and type of sex chromosome normally present in a human egg cell is

a) 44 + XY
b) 44 + XX
c) 22 + Y
d) 22 + X

65. The highest energy content in terms of calorific value is found in

a) wheat
b) rice
c) potatoes (cooked)
d) milk

66. In photosynthesis, photolysis refers to

a) breakdown of photons of light
b) breakdown of water in light reaction
c) breakdown of water in dark reaction
d) breakdown of photons of light irrespective of light conditions

67. Four-chambered heart is present in

a) hag fish
b) frog
c) snake
d) pigeon

68. Foot and mouth disease is common in

a) cows
b) poultry birds
c) sheep
d) dog

69. Phloem in plants has :

a) sieve tubes, companion cells and phloem parenchyma
b) tracheids, companion cells and phloem parenchyma
c) sieve tube, tracheids, phloem parenchyma
d) vessels, tracheids, phloem parenchyma

70. Double-fertilization involves fusion of :

a) two male gametes with the egg
b) one male gamete with the egg and the second male gamete with another cell in embryo sac
c) the male gamete with egg and fusion of two polar nuclei
d) one male gamete with egg and the other with two polar nuclei

71. Meiosis in plants occurs in
    a) leaves
    b) shoot tip
    c) root tip
    d) flowers

72. Sprouted grains have better food value be-
    cause they get enriched with
    a) vitamin A and D
    b) vitamin C and B complex
    c) more protein
    d) more carbohydrates

73. Chromosomes are made up of
    a) DNA only
    b) DNA and RNA
    c) DNA and protein
    d) RNA only

74. Many bacteria that enter the circulatory sys-
    tem are engulfed and destroyed by
    a) phagocytic white blood cells
    b) pinocytic red blood cells
    c) plasma
    d) platelets

75. Secretory organelle of the cell is :
    a) endoplasmic reticulum
    b) peroxisomes
    c) lysosomes
    4) golgi bodies