STUDY VAULT
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Class – X

ENTRANCE TEST CUM SCHOLARSHIP (SAMPLE PAPER-1)

[Time: 3 Hours] [Max Marks: 450]

A. *General:*

1. *This booklet is a Question Paper containing 150 questions.*
2. *Blank Papers, Clipboards, Log Tables, slide rules, calculators, cellular phones and electronic gadgets in any form are not allowed to be carried inside the examination hall.*
3. *The answer sheet, a machine-readable optical mark recognition sheet (OMR Sheet), is provided separately.*
4. *DO NOT TAMPER WITH THE OMR OR THE BOOKLET.*
5. *Please fill your roll number correctly in the OMR sheet (answer sheet).*
6. *Both Question Paper and OMR Answer Sheet will be submitted after completion of this examination.*

B. *Question Paper Format and marking scheme:*

1. *The Question Paper consists of five parts (Part I: MAT, Part II: Physics, Part III: Chemistry, Part IV: Mathematics).*
2. *Each Question carries +3 marks for correct answer and -1 mark for incorrect answer.*

MAT

1. If in a certain language 'CLOCK' is written as 'MDNKD', then how 'PRESENT' will be coded in that language.

(a) FOSQRUT (b) FSQRUOF (c) FSQRUMF (d) FSQROMF

2. Find the question mark in the following figure

150	7
157	23
180	– 38
?	0

(a) 190 (b) 152 (c) 142 (d) 228

3. Which group of letters is different from others?

(a) PQSRT (b) ABDCE (c) MNPOQ (d) EFGHI

4. In the given question, choose the correct alternate to complete the series.

r _ t _ v _ s _ u _ rs _ u _

(a) stvtvru (b) surtvtv (c) rutvstu (d) sturvvv

5. Find the next number in the series.

1, 8, 9, 64, 25, 216, 49,?

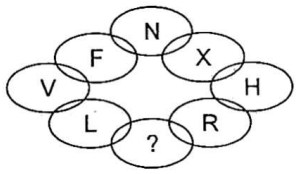
(a) 265 (b) 512 (c) 343 (d) 215

6. Choose the correct alternative which replaces the question mark.

1, 0, 2, –1, 3, –2, 4,?

(a) 3 (b) –3 (c) –4 (d) 5

7. Insert the missing letter in the diagram below.

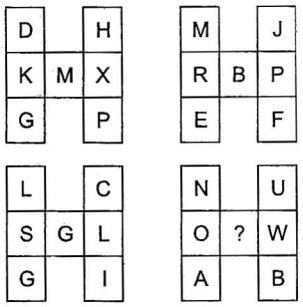


(a) C (b) B (c) Z (d) A

8. In a question, 55 + 10 = 20 and 45 + 40 = 49, then how 95 + 70 = ?

(a) 165 (b) 84 (c) 155 (d) 48

9. Which letter will replace the question mark from given altervatives?



(a) H (b) I (c) J (d) K

Direction (10-11) : *Find the statement which is true according to the given information below.*

10. On weekends, Mr Sanchez spends many hours working in his vegetable and flower gardens. Mrs Sanchez spends her free time reading and listening to classical music. Both Mr Sanchez and Mrs Sanchez like to cook.

(a) Mr Sanchez enjoys planting and growing vegetables

(b) Mr Sanchez does not like classical music

(c) Mrs Sanchez cooks the vegetables that Mr Sanchez grows

(d) Mrs Sanchez enjoys reading nineteen century novels

11. Georgia is older than her cousin Marsha. Marsha's brother bart is older than Georgia. When Marsha and bart are visiting with Georgia, all three like to play a game of Monopoly. Marsha wins more often than Georgia does.

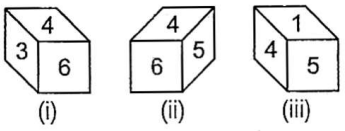
(a) When he plays Monopoly with Marsha and Georgia, Bart often loses

(b) Of the three, Georgia is the oldest

(c) Georgia hates to lose at Monopoly

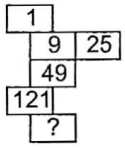
(d) Of the three, Marsha is the youngest

12. On the basis of three position of dice, which number will appear on the face opposite the number 6.



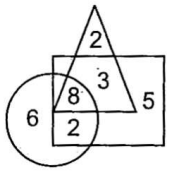
(a) 3 (b) 2 (c) 1 (d) 5

13. Identify which alternate can replace the question mark?



(a) 165 (b) 169 (c) 167 (d) 144

14. In the given figure, triangle represents 10^{th} passed students, square represents 12^{th} passed students and circle represents those students who are persuing graduation. How many students are 10^{th} and 12^{th} passed but not persuing graduation in the given figure.



(a) Only 2 (b) Only 5 (c) Only 3 (d) Only 6

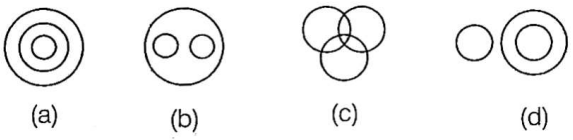
15. Which of the following is the mirror image of 'CORDIAL', if the mirror is placed below the word?

(a) CORDIAL (b) CORDIAL (c) DIALROC (d) LAIDROC

16. A deer runs from southern side of a forest and runs 800 m, then takes a right turn and runs 200 m. After that again he took a right turn and runs 500 m. In which direction deer is now, from the starting point?

(a) North-East (b) South-West (c) North-West (d) South-East

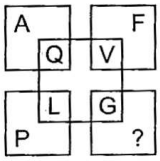
Directions (17-18) : *Which of the diagram indicates the relation between given questions.*



17. Male, Nephew, Niece

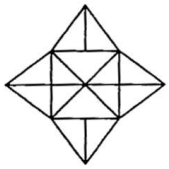
18. Dog, Cow, Animal

19. Find out the missing character in the following figure matrix



(a) R (b) Q (c) K (d) P

20. How many triangles are in the given figure?



(a) 28 (b) 18 (c) 20 (d) 32

Directions (21-23) : *Read the following information carefully and answer the questions given below.*

Six films U, V, W, X, Y and Z are to be released on consecutive Fridays. The schedule of the release is to be in accordance with the following conditions. 'U' must be released a week before 'Y'. 'W' must not be released immediately after the first release. 'V' must be released on the Friday following the Friday on which 'Z' is released. 'X' must be released on fifth Firday and should not be preceded by 'V'. 'Y' must not be released in the last.

21. In between which of the two film, 'X' is to be released?

(a) Y and W (b) W and Z (c) Z and U (d) V and Y

22. Which of the following film preceded 'Y'?

(a) U (b) X (c) V (d) Z

23. Which of the following films released first?

(a) U (b) V (c) W (d) Z

24. Which number replaces the question mark?

(a) 29 (b) 39 (c) 25 (d) 22

***Direction* (25-26) :** *In each question below are given three statements followed by three conclusions numbered I, II and III. You have to take the given three statements to be true even, if they seem to be at variance from commonly known facts. Read the conclusions and then decide which of the given conclusion logically follows from the three given statements, disregarding commonly known facts.*

Given answer

(a) if only Conclusion I follows
(b) if only Conclusion II follows
(c) if either Conclusion I or II follows
(d) if both Conclusion I & II follow

25. Statements

All cooler are AC.
Some AC are fan.
All fan are air.

Conclusions

I. Some fan are AC.
II. Some fan are air.
III. Some air are cooler.

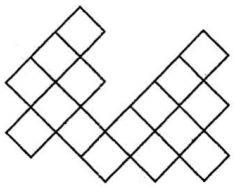
26. Statements

Some flutes are sitars.
All sitars are gitars.
some gitars are musical instruments.

Conclusion

I. Some flutes are gitar.
II. No flutes is gitar.
III. Some musical instruments are flutes.

27. How many cubes are there in following figure?



(a) 14 (b) 15 (c) 16 (d) 17

28. Robert is travelling in his cycle and has calculated the time to reach point A. He will reach there at 2 pm if he travels at 10 km/h and he will reach there at 12 noon, if he travels at 15 km/h. At what speed must he travel to reach A at 1 pm?

(a) 8 km/h (b) 11 km/h (c) 12 km/h (d) 14 km/h

29. A farmer travelled a distance of 61 km in 9 h. He travelled partly on foot at the rate of 4 km/h and partly on bicycle at the rate of 9 km/h. The distance travelled on foot is.

(a) 16 km (b) 45 km (c) 15 km (d) 17 km

30. 6 yrs ago, the ratio of ages of Deepa and Nisha was 6 : 5. 4 yr, hence the ratio of their ages will be 11 : 10. What is the present age of Nisha?

(a) 16 yr (b) 12 yr (c) 18 yr (d) 32 yr

PHYSICS

31. 'n' equal resistors are first connected in series and then connected in parallel. What is the ratio of the maximum to the minimum resistance?

(a) n (b) $1/n^2$ (c) n^2 (d) $1/n$

32. The refractive index of diamond is 2.4. If the velocity of light in air or vacuum is 3×10^8 m s^{-1}, then the velocity of light in diamond is $5A \times 10^8$ m s^{-1}. Find value of A?

(a) 1.25 (b) 0.25 (c) 0.16 (d) 0.8

33. The masses of the three wires of copper are in the ratio of 1 : 3 : 5 and their length are in the ratio of 5 : 3 : 1. Find the ratio of their resistance.

(a) 1: 3 : 5 (b) 5 : 3 : 1 (c) 1 : 25 : 125 (d) 125 :15 : 1

34. Quantum theory of light was given by:

(a) Newton (b) Plank (c) Faraday (d) None of these

35. In a neon gas discharge tube 2.9×10^{18} ions move to the right through a cross-section of the tube each second, while 1.2×10^{18} electrons move to the left in this time. The electronic charge is 1.6×10^{-19} coulomb. Then the net electric current in the tube is:

(a) 1 amp to the right (b) 0.66 amp to the right

(c) 0.66 amp to the left (d) Zero

36. In an experiment to determine the focal length (f) for a concave mirror by u-v method, a student places the object pin A on the principal axis at a distance x from the pole P. The student looks at the pin and its inverted image from a distance keeping his/her eye in line with PA. When the student shift his/her eyes towards left, the image appears to the right of the object pin. Then

(a) $x < f$ (b) $f < x < 2f$ (c) $x = 2f$ (d) $x > 2f$

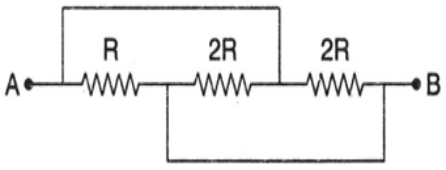
37. Resistance of an ideal voltmeter is :

(a) Low (b) Very low (c) Infinite (d) Can't say

38. Human eye has maximum luminous efficiency to ..... light.

(a) yellow (b) red (c) violet (d) green

39. The equivalent resistance between points A and B in the circuit shown is:



(a) 5R (b) 2R (c) $\frac{R}{2}$ (d) $\frac{6R}{5}$

40. Find the incorrect statements related to the rainbow

(a) The rainbow is formed in the same direction to the position of the sun

(b) When the light rays undergo dispersion and total internal reflection, the water droplets present in the atmosphere forms rainbow

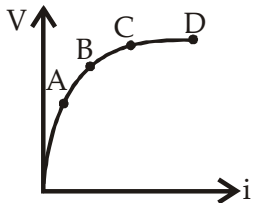
(c) A rainbow is formed in the shape of circle

(d) When light rays undergo one internal reflection and two refractions produce primary rainbow whereas two internal reflections and two refractions produces secondary rainbow

41. Person suffering from myopia must wear:

(a) Convex lens (b) Concave lens (c) Plane lens (d) Bifocal lens

42. Variation of current passing through a conductor as the voltage applied across its ends is varied as shown in the adjoining diagram. If the resistance (R) is determined at the points A, B, C, and D, we will find that



(a) $R_C = R_D$ (b) $R_B > R_A$ (c) $R_C > R_B$ (d) $R_A > R_B$

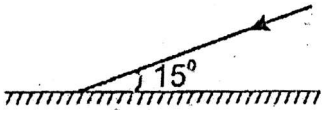
43. A convex mirror of focal length f (in air) is immersed in a liquid $\left(\mu = \frac{4}{3}\right)$. The focal length of the mirror in liquid will be .

(a) $\left(\frac{3}{4}\right)f$ (b) $\left(\frac{4}{3}\right)f$ (c) f (d) $\left(\frac{7}{3}\right)f$

44. An observer runs towards a plane mirror with a velocity × m/s. What is the velocity of this image which will appear to move towards him?

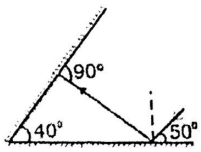
(a) 2x m/s (b) $\frac{x}{2}$ m/s (c) x m/s (d) $\frac{x}{4}$ m/s

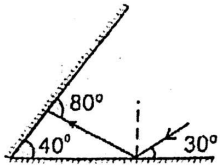
45. When a ray of light strikes a plane mirror at an angle of 15° with the mirror, what will be the angle through which the ray get deviated?

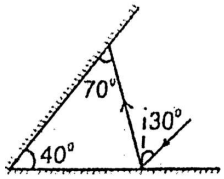


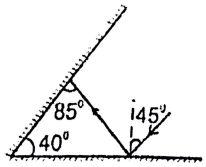
(a) 150° (b) 30° (c) 75° (d) none of these

46. Which of the following correctly depicts reflections in case of plane mirrors inclined at 40°?

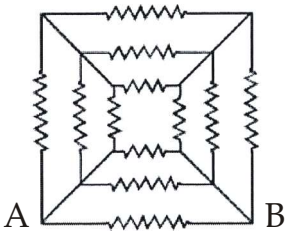
(a) 

(b) 

(c) 

(d) 

47. Twelve resistors each of resistance 16Ω are connected in the circuit as shown. The net resistance between AB is



(a) 1Ω (b) 2Ω (c) 3Ω (d) 4Ω

48. A virtual image larger than the object can be produced by:

(a) convex mirror (b) concave mirror (c) plance mirror (d) concave lens

49. when a object is placed in front of convex mirror of focal length 20 cm at a distance 25 cm from the pole. The :

(1) the image formed is erected (2) the image formed is inverted

(3) the image formed is real (4) the image formed is virtual

(a) 2 and 4 are correct (b) 2 and 3 are correct

(c) 1 and 3 are correct (d) 1 and 4 are correct

50. One kilowatt is equal to _____ horse power.

(a) 1.34 (b) 1.32 (c) 1.28 (d) 1.38

51. In a series circuit,

(a) current flow is same in all the resistors of the circuit

(b) potential difference across each resistor in the ciruit is same

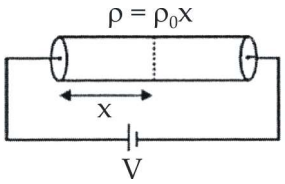
(c) Both (a) and (b)

(d) None of these

52. The masses of the three wires of copper are in the ratio of 1 : 3 : 5 and their lengths are in the ratio of 5 : 3 : 1. The ratio of their electrical resistance is

(a) 1 : 3 : 5 (b) 5 : 3 : 1 (c) 1 : 25 : 125 (d) 125 : 25 : 1

53. A cylindrical solid of length L and radius a is having varying resistivity given by $\rho = \rho_0 x$, where ρ_0 is a positive constant and x is measured from left end of solid. The cell shown in the figure is having emf V and negligible internal resistance. The electric field as a function of x is best described by

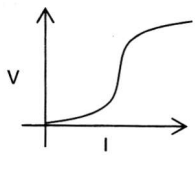


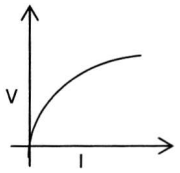
(a) $\frac{2V}{L^2}x$ (b) $\frac{2V}{\rho_0 L^2}x$ (c) $\frac{V}{L^2}x$ (d) None of these

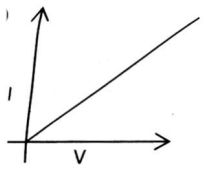
54. Units of electrical resistance is :

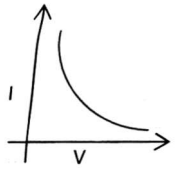
(a) kg m^2 sec^{-3} A^{-1} (b) kg m sec^{-3} A^{-2} (c) kg m^3 sec^3 A^{-2} (d) kg m^2 sec^{-3} A^{-2}

55. Which of the following graphs represents an ohmic conductor?

(a) 

(b) 

(c) 

(d) 

56. n equal resistors are first connected in series and then connected in parallel. What is the ratio of the maximum to the minimum resistance?

(a) n (b) $1/n^2$ (c) n^2 (d) $1/n$

57. You are given resistance coil and a battery. In which of the following cases is largest amount of heat generated?

(a) When the coil is connected to the battery directly

(b) When the coil is divided into two equal parts and both the parts are connected to the battery in parallel

(c) When the coil is divided into four equal parts and all the four parts are connected to the battery in parallel

(d) When only half the coil is connected to the battery

58. When one unit electric charge moves from one point to another point in an electric circuit, then the amount of work done in joules is known as

(a) Electric current (b) electric resistance

(c) electric conductance (d) potential difference

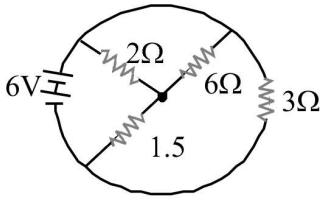
59. The hindrance presented by material of conductor to the smooth passing of electric current is known as:

(a) Resistance (b) Conductance (c) Inductance (d) None of these

60. The co-ordinates of a moving particle at any time 't' are given by $x = \alpha t^3$ and $y = \beta t^3$. The speed of the particle at time 't' is given by

(a) $3t\sqrt{\alpha^2+\beta^2}$ (b) $3t^2\sqrt{\alpha^2+\beta^2}$ (c) $t^2\sqrt{\alpha^2+\beta^2}$ (d) $\sqrt{\alpha^2+\beta^2}$

61. The total current supplied to the circuit by the battery is



(a) 1 A (b) 2 A (c) 4 A (d) 6 A

62. A goods train accelerating uniformly on a straight railway track, approaches an electric pole standing on the side of track. Its engine passes the pole with velocity u and the guard's room passes with velocity v. The middle wagon of the train passes the pole with a velocity

(a) $\frac{u+v}{2}$ (b) $\frac{1}{2}\sqrt{u^2+v^2}$ (c) $\sqrt{uv}$ (d) $\sqrt{\left(\frac{u^2+v^2}{2}\right)}$

63. The purpose of a rheostat is:

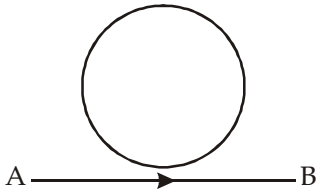
(a) Increase the magnitude of current only

(b) Decrease the magnitude of current only

(c) Increase or decrease the magnitude of current

(d) None of these

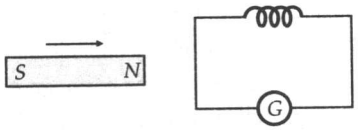
64. The current flows from A to B as shown in the figure. The direction of the induced current in the loop is



(a) clockwise (b) anticlockwise

(c) straight line (d) none of these

65. As shown in the figure, a magnet is moved with a fast speed towards a coil at rest. Due to this induced emf, induced current and induced charge in the coil are E, I and Q respectively. If the speed of the magnet is doubled, the incorrect statement is



(a) E increases (b) I increases (c) Q remains same (d) Q decreases

66. A battery of 6V is connected in series with resistors of 0.1 ohm, 0.15 ohm, 0.2 ohm, 0.25 ohm and 6 ohm. How much current would flow through the 0.3 ohm resistor?

(a) 0.895A (b) 2.22A (c) 1A (d) none of these

67. A 5.0 MeV proton is falling vertically downward through a region of magnetic field 1.5 T acting horizontally from south to north. Find the magnitude of the magnetic force exerted on the proton. Take mass of the proton as 1.6×10^{-27} kg.

(a) 7.58×10^{-12} N (b) 7.58 N (c) 7.58×10^{-6} N (d) 7.58×10^{-9} N

68. If a particle of charge q is moving with velocity v along the z-axis and the magnetic field B is acting along the x-axis, use the expression $\vec{F} = q(\vec{v} \times \vec{b})$ to find the direction of the force F acting on it.

A beam of proton passes undeflected with a horizontal velocity v, through a region of electric and magnetic fields, mutually perpendicular to each other and normal to the direction of the beam. If the magnitudes of the electric and magnetic fields are 100 kV/m and 50 mT respectively, calculate velocity v of the beam.

(a) 2×10^6 m/s (b) 4×10^6 m/s (c) 3×10^6 m/s (d) 1×10^6 m/s

69. If we release a magnet held in our hand, it falls to the ground. The force which makes the magnet fall down is an example of:

(a) balanced force (b) unbalanced force (c) magnetic force (d) muscular force

70. A particle starts moving rectilinearly at time t = 0 such that its velocity v changes with time t according to the equation $v = t^2 - t$ where t is in seconds and v is in m/s. Find the time interval for which the particle retards.

(a) $\frac{1}{2} < t$ (b) $t > 1$ (c) $\frac{1}{4} < t < 1$ (d) $\frac{1}{4} < t < \frac{3}{4}$

CHEMISTRY

71. Which substance is used as a leaching agent in concentration of bauxite?

(a) H_2O (b) KOH (c) NaOH (d) CaO

72. $BaCl_2 + H_2SO_4 \longrightarrow BaSO_4 + 2HCl$ is :

(a) combination reaction (b) decomposition reaction

(c) displacement reaction (d) double displacement reaction

73. The conjugate base of HPO_4^{2-} is:

(a) PO_4^{3-} (b) H_2PO_3 (c) H_3PO_4 (d) H_2PO_2

74. pH + pOH =

(a) 14 (b) 7 (c) 6 (d) 0

75. Plaster of Paris has the formula :

(a) $CaSO_4 \cdot \frac{1}{2}H_2O$ (b) $CaSO_4.H_2O$ (c) $CaSO_4.1\frac{1}{2}H_2O$ (d) $CaSO_4.2H_2O$

76. Which of the following oxides will turn moist blue litmus red?

(a) CO (b) NO (c) N_2O (d) P_2O_5

77. Gypsum is added to cement because:

(a) it makes the cement very hard

(b) it increases the pace of setting of cement

(c) it slows down the initial setting of cement when water is added

(d) none of the above

78. A mineral is known as ore if metal

(a) cannot be produced from it (b) can be produced from it

(c) can be extracted from it profitably (d) is very costly

79. The formula of Silver Phosphate is :

(a) $AgPO_4$ (b) Ag_3PO_4 (c) $Ag_2(PO_4)_3$ (d) Ag_2PO_4

80. The formula of Oleum is :

(a) H_2SO_4 (b) $H_2S_2O_7$ (c) $H_2S_2O_3$ (d) $H_2S_2O_6$

81. In the reaction $M + O_2 \rightarrow MO_2$ (super oxide) the metal is :

(a) Li (b) Na (c) K (d) All of these

82. Hydrogen gas is passed through oil in order to

(a) convert lower oil to higher oil

(b) convert liquid oil into solidified oil

(c) convert unsaturated hydrocarbon to saturated hydrocarbon

(d) all the above statements are wrong

83. Which of the following acid is present in vinegar?

(a) lactic acid (b) malic acid (c) acetic acid (d) tartaric acid

84. Acid + Base $\rightarrow$ Salt + Water. This reaction is known as :

(a) neutralisation reaction (b) decomposition reaction

(c) precipitation reaction (d) displacement reaction

85. The valency of mercurous ion is

(a) two (b) one (c) three (d) four

86. The red or orange coating that forms on the surface of iron when exposed to air and moisture for some time is called

(a) galvanisation (b) electroplating (c) rust (d) reduction

87. Sodium is a

(a) silvery white and very soft metal (b) colourless and hard metal

(c) silvery white and very hard metal (d) colourless and very soft metal

88. Which element is an important component of transistors?

(a) sodium (b) copper (c) germanium (d) radium

89. A metal which is a poor conducton of heat is _____.

(a) lead (b) gold (c) zinc (d) iron

90. The reaction used to join railway tracks involves reducing agent

(a) Al (b) Mg (c) C (d) CO

91. All salts are :

(a) strong electrolytes (b) weak electrolytes

(c) non electrolytes (d) either weak or strong electrolytes

92. When a small piece of dry sodium is put in water, it reacts vigorously to produce:

(a) nitrogen gas (b) hydrogen gas (c) carbon dioxide gas (d) sulphur dioxide

93. The pH of three solutions A, B, C is 6, 4, 8 respectively. Which of the following is the correct option?

(a) A > B > C decreasing acidic strength (b) C > B >A increasing acidic strength

(c) B > A > C is decreasing acidic strength (d) C > B > A decreasing acidic strength

94. Which of the following is used for making magnets?

(a) duralumin (b) magnalium (c) bronze (d) alnico

95. Iron burns in air to form :

(a) FeO (b) Fe_2O_3 (c) Fe_3O_4 (d) FeO_2

96. A is an aqueous solution of acid and B is an aqueous solution of base. These are diluted separately then:

(a) pH of A increases while that of B decreases till neutral

(b) pH of A deceases while that of B increases till neutral

(c) pH of A and B decreases

(d) pH of A and B increases

97. Which of the following electrolytes exhibits maximum conductivity?

(a) 1 M NaCl (b) 1 M KCl (c) 1 M $Ca(NO_3)_2$ (d) 1 M $Al_2(SO_4)_3$

98. What happens to the colour of litmus paper when a drop of acid falls on it?

(a) colour fades (b) from blue it turns red

(c) from red it turns blue (d) remains unchanged

99. The international standards of weight and measures are made of :

(a) gold – silver alloys (b) platinum – iridium alloys

(c) copper – gold alloys (d) platinum – iron alloys

100. Identify the metal that reacts with concentrated H_2SO_4 or HNO_3, but not with concentrated HCl.

(a) Fe (b) Zn (c) Cu (d) Al

101. Fats + NaOH $\rightarrow$ _____ + Glycerol. One of the product formed in this reaction is

(a) soap (b) cloth (c) paper (d) wood

102. In the reaction of $Zn + FeSO_4 \rightarrow ZnSO_4 + Fe$

(a) Zn gets oxidized (b) Fe gets oxidized

(c) Zn is oxidizing agent (d) Zn and Fe both get oxidized

103. Which of the following reagents is used to test the presence of SO_2 gas?

(a) acidified potassium permanaganate (b) alkaline potassium permanganate

(c) alkaline potassium dichromate (d) acidified potassium dichromate

104. The substance that lose electrons is called as :

(a) oxidizing agent (b) reducing agent (c) catalyst (d) none of above

105. Which of the following steps not involved in extraction of Aluminium?

(a) Crushing (b) Pulverisation (c) Froth floatation (d) Electrolytic Refining

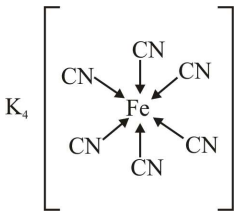
106. If an isotope has two neutrons in its atom, the atomic number and mass number will respectively be:

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

107. Sulphur molecule in solid state is:

(a) Diatomic (b) Tetra-atomic (c) Triatomic (d) Octa-atomic

108. Identify the Lewi's acid in the given below complex.



(a) Fe (b) CN (c) K (d) $K_4[Fe(CN)_6]$

109. Which of the following has lowest normality?

(a) 1 M H_2SO_4 (b) 1M H_3PO_4 (c) 1 M HNO_3 (d) 1 M H_3PO_3

110. The following acids have been arranged in the order of decreasing acid strength. Identify the correct order

ClOH (I), BrOH (II), IOH (III)

(a) I > II > III (b) II > I > III (c) III > II > I (d) I > III > II

MATHEMATICS

111. The notation N(x) means the number of prime number less than x. What is the value of N(N(30))? (Remember that 1 is not a prime number).

(a) 4 (b) 5 (c) 10 (d) 23

112. If n! = n × (n – 1) × (n – 2) × … × 1, then the number of perfect squares in the infinite sequence

1!, 1! + 2!, 1! + 2! + 3!, …, 1! + 2! + 3! + 4! + … + n!, … is

(a) 0 (b) 2 (c) 3 (d) more than 5

113. The number $1 + 3 + 3^3 + ... + 3^{23}$ is divisible by exactly two numbers between 724 and 734. What are they?

(a) 728 and 730 (b) 726 and 728 (c) 726 and 730 (d) 730 and 732

114. The sum of a certain number of positive integers is 31. What is the biggest their product can be?

(a) 55296 (b) 78732 (c) 118098 (d) 49152

115. For how many whole numbers between 100 and 999 does the product of the ones digit and tens digit equal the hundreds digit?

(a) 20 (b) 23 (c) 21 (d) 25

116. A book with 12 pages needs the 15 digits 1, 2, 3, 4, 5, 6, 7, 8, 9, 1, 0, 1, 1, 1, 2 in order to number all the pages. Which one of the following numbers cannot be the number of digits needed in order to number all the pages of a book?

(a) 543 (b) 1998 (c) 1999 (d) 2001

117. The average of the nine numbers

9 99 999 9999 99999 999999 9999999 99999999 999999999

is a nine-digit number M, all of whose digits are different. The number M does not contain

the digit

(a) 7 (b) 1 (c) 5 (d) 0

118. An ordered pair (n, m) of positive integers satisfying $\frac{1}{n}-\frac{1}{m}+\frac{1}{mn}=\frac{2}{5}$. What is mn?

(a) 5 (b) 10 (c) 15 (d) 20

119. If a, b are the zeros of $f(x) = x^2 + px + 1$ and c, d are the zeros of $f(x) = x^2 + qx + 1$ the value of $E = (a - c)(b - c)(a + d)(b + d)$ is–

(a) $p^2 - q^2$ (b) $q^2 - p^2$ (c) $q^2 + p^2$ (d) None of these

120. If $a(p + q)^2 + 2bpq + c = 0$ and also $a(q + r)^2 + 2bqr + c = 0$ then pr is equal to –

(a) $p^2 + \frac{a}{c}$ (b) $q^2 + \frac{c}{a}$ (c) $p^2 + \frac{a}{b}$ (d) $q^2 + \frac{a}{c}$

121. If a,b and c are not all equal and α and β be the zeros of the polynomial $ax^2 + bx + c$, then value of $(1 + \alpha + \alpha^2)(1 + \beta + \beta^2)$ is :

(a) 0 (b) positive (c) negative (d) non-negative

122. If the parabola $f(x) = ax^2 + bx + c$ passes through the points (–1, 12), (0, 5) and (2, –3), the value of a + b + c is –

(a) – 4 (b) – 2 (c) Zero (d) 1

123. The number of solutions of the equation $2x + y = 40$, where both x and y are positive integers and $x \le y$ is :

(a) 7 (b) 13 (c) 14 (d) 18

124. A single reservoir supplies the petrol to the whole city, while the reservoir is fed by a single pipeline filling the reservoir with the stream of uniform volume. When the reservoir is full and if 40000 litres of petrol is used daily, the supply fails in 90 days. If 32000 litres of petrol is used daily, the supply fails in 60 days. How much petrol can be used daily without the supply ever failing?

(a) 64000 litres (b) 56000 litres (c) 78000 litres (d) 60000 litres

125. In town, $\frac{2}{3}$ of men are married to $\frac{3}{7}$ of the women. In the town total population is more than 1000.

If all marriages happen within the town. The smallest possible number of total population is (assume there are only adults in the town) :

(a) 1012 (b) 1035 (c) 1058 (d) None of these

126. The pair of linear equations $2x + ky - 3 = 0$, $6x + \frac{2}{3}y + 7 = 0$ has a unique solution if –

(a) $k = \frac{2}{3}$ (b) $k \ne \frac{2}{3}$ (c) $k = \frac{2}{9}$ (d) $k \ne \frac{2}{9}$

127. If both the roots of the equations $k(6x^2 + 3) + rx + 2x^2 - 1 = 0$ and $6k(2x^2 + 1) + px + 4x^2 - 2 = 0$ are common, then $2r - p$ is equal to :

(a) 1 (b) – 1 (c) 2 (d) 0

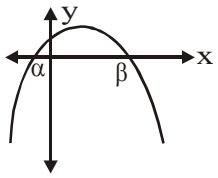
128. If every pair from among the equations $x^2 + px + qr = 0$, $x^2 + qx + rp = 0$ and $x^2 + rx + pq = 0$ has a common root, then the sum of the three common roots is :

(a) $2(p + q + r)$ (b) $p + q + r$ (c) $-(p + q + r)$ (d) pqr

129. If α, β are the roots of $x^2 + x + 1 = 0$, the equation whose roots are α^{19}, β^7 is :

(a) $x^2 - x - 1 = 0$ (b) $x^2 - x + 1 = 0$ (c) $x^2 + x - 1 = 0$ (d) $x^2 + x + 1 = 0$

130. The adjoining figure shows the graph of $y = ax^2 + bx + c$. Then which of the following is correct :



(i) $a > 0$ (ii) $b > 0$ (iii) $c > 0$ (iv) $b^2 < 4ac$

(a) (i) and (iv) (b) (ii) and (iii) (c) (iii) & (iv) (d) None of these

131. If α,β are roots of the quadratic equation $x^2 + bx - c = 0$, then the equation whose roots are b and c is

(a) $x^2 + \alpha x - \beta = 0$ (b) $x^2 - [(\alpha + \beta) + \alpha\beta]\, x - \alpha\beta\,(\alpha + \beta) = 0$

(c) $x^2 + (\alpha\beta + \alpha + \beta)\, x + \alpha\beta\,(\alpha + \beta) = 0$ (d) $x^2 + (\alpha\beta + \alpha + \beta)\, x - \alpha\beta\,(\alpha + \beta) = 0$

132. If α is a root, repeated twice, of the quadratic equation $(a - d)x^2 + ax + (a + d) = 0$ then $\frac{d^2}{a^2}$ has the value equal to:

(a) $\sin^2 90^\circ$ (b) $\cos^2 60^\circ$ (c) $\sin^2 45^\circ$ (d) $\cos^2 30^\circ$

133. The angles of depression of two points from the top of the tower are 30° and 60°. If the height of the tower is 30 m, then find the maximum possible distance between the two points.

(a) $40\sqrt{3}$ m (b) $30\sqrt{3}$ m (c) $20\sqrt{3}$ m (d) $10\sqrt{3}$ m

134. If $\sqrt{2}\cos\theta - \sqrt{6}\sin\theta = 2\sqrt{2}$, then the value of θ can be _____.

(a) 0° (b) –45° (c) 30° (d) –60°

135. If $2\sin\alpha + 3\cos\alpha = 2$, then $3\sin\alpha - 2\cos\alpha =$ _____.

(a) ± 3 (b) ± 1 (c) 0 (d) ± 3

136. If $x^{1/3} + y^{1/3} + z^{1/3} = 0$, then which of the following expression is correct :

(a) $x^3 + y^3 + z^3 = 0$ (b) $x + y + z = 3x^{1/3}y^{1/3}z^{1/3}$

(c) $x + y + z = 3xyz$ (d) $x^3 + y^3 + z^3 = 3xyz$

137. If $\sin^4 A - \cos^4 A = 1$, then (A/2) is _____ $(0 < A \le 90^\circ)$.

(a) 45° (b) 60° (c) 30° (d) 40°

138. If $\sin 20^\circ = p$, then find the value of $\left(\frac{\sin 380^\circ - \sin 340^\circ}{\cos 380^\circ + \cos 340^\circ}\right)$.

(a) $\sqrt{1-p^2}$ (b) $\sqrt{\frac{1-p^2}{p}}$ (c) $\frac{p}{\sqrt{1-p^2}}$ (d) None of these

139. If the sun ray's inclination increases from 45° to 60°, the length of the shadow of a tower decreases by 50 m. Find the height of the tower (in m).

(a) $50\left(\sqrt{3}-1\right)$ (b) $75\left(3-\sqrt{3}\right)$ (c) $100\left(\sqrt{3}+1\right)$ (d) $25\left(3+\sqrt{3}\right)$

140. Find the value of $\tan\left(22\frac{1^\circ}{2}\right)$.

(a) $\sqrt{2}-1$ (b) $1+\sqrt{2}$ (c) $2+\sqrt{3}$ (d) $2-\sqrt{3}$

141. If the difference between the mode and median is 2, then the difference between the median and mean is _____ (in the given order).

(a) 2 (b) 4 (c) 1 (d) 0

142. The mean of the data x, x + a, x + 2a, x + 3a, ..., (2n + 1 terms) is _____.

(a) x + (n – 1)a (b) x + (n + 1)a (c) x + (n + 2)a (d) x + an

143. From a well shuffled pack of 52 cards, three cards are drawn without replacing. Find the probability of drawing an ace, a king and a jack.

(a) $\frac{16}{5525}$ (b) $\frac{16}{625}$ (c) $\frac{16}{3125}$ (d) None of these

144. Four cards are drawn at random from a pack of 52 cards. Find the probability of getting all the four cards of same suit.

(a) $\frac{17}{1665}$ (b) $\frac{1}{20825}$ (c) $\frac{7}{25850}$ (d) None of these

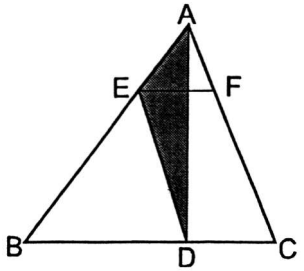
145. A bag contains 8 balls numbered 1 to 8. If 2 balls are picked at random, then find the probability of the two balls being 2 and 3.

(a) $\frac{1}{28}$ (b) $\frac{3}{27}$ (c) $\frac{1}{14}$ (d) $\frac{1}{7}$

146. A number is selected from the set {1, 2, 3, 4, 5, 6, 7, 8}. What is the probability that it will be a root of the equation $x^2 - 6x + 8 = 0$?

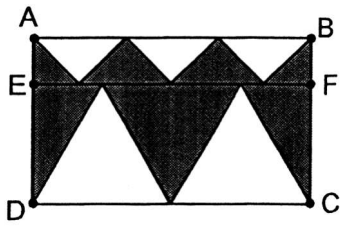
(a) $\frac{1}{3}$ (b) $\frac{2}{3}$ (c) $\frac{3}{4}$ (d) $\frac{1}{4}$

147. In the figure shown, DEFC is a parallelogram with area of 28 cm^2. Points D, E and F lie on $\overline{BC}$, $\overline{AB}$ and $\overline{AC}$ respectively. Find the area of the shaded region (in cm^2).



(a) 14 (b) 15 (c) 16 (d) 17

148. In the figure shown, ABCD and CDEF are rectangles, AB = 4 and BC = 3. Find the area of the shaded region (in unit square).



(a) 4 (b) 5 (c) 6 (d) 7

149. If a sphere is placed inside a right circular cylinder so as to touch the top, base and the lateral surface of the cylinder. If the radius of the sphere is R, the volume of the cylinder is :

(a) $2\pi R^3$ (b) $8\pi R^3$ (c) $\frac{4}{3}\pi R^3$ (d) None of these

150. A cylinder is circumscribed about a hemisphere and a cone is inscribed in the cylinder so as to have its vertex at the centre of one end and the other end as its base. The volumes of the cylinder, hemisphere and the cone are respectively in the ratio of:

(a) $3 : \sqrt{3} : 2$ (b) 3 : 2 : 1 (c) 1 : 2 : 3 (d) 2 : 3 : 1